

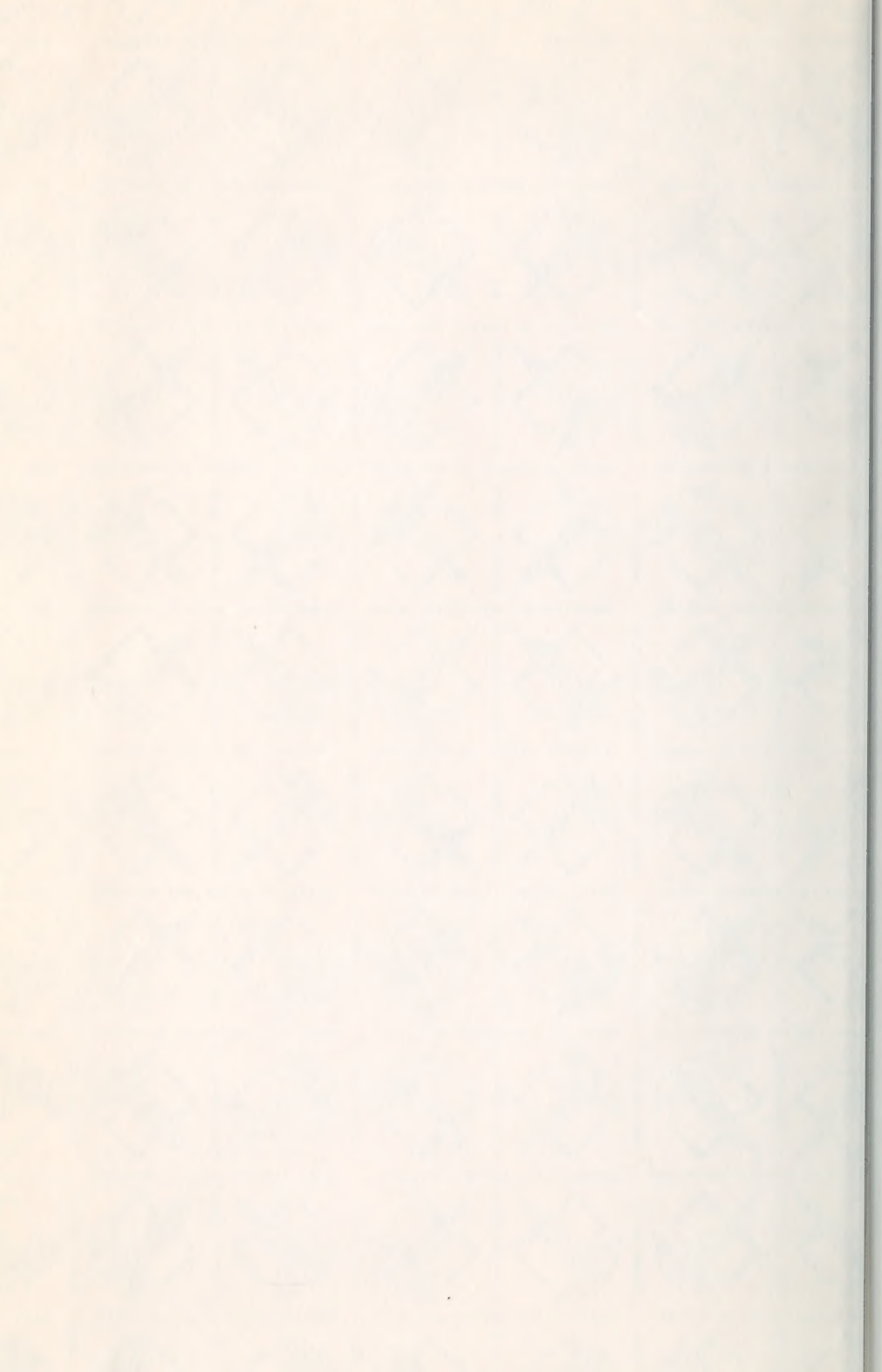


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DIAGRAMS

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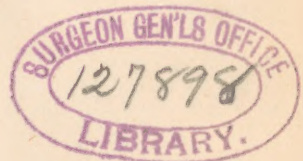


VITAL STATISTICS OF MICHIGAN, 1870,

AND

STATISTICS OF MICHIGAN, 1870.

Also so much of the text of the two volumes mentioned
as particularly refers to the Diagrams.



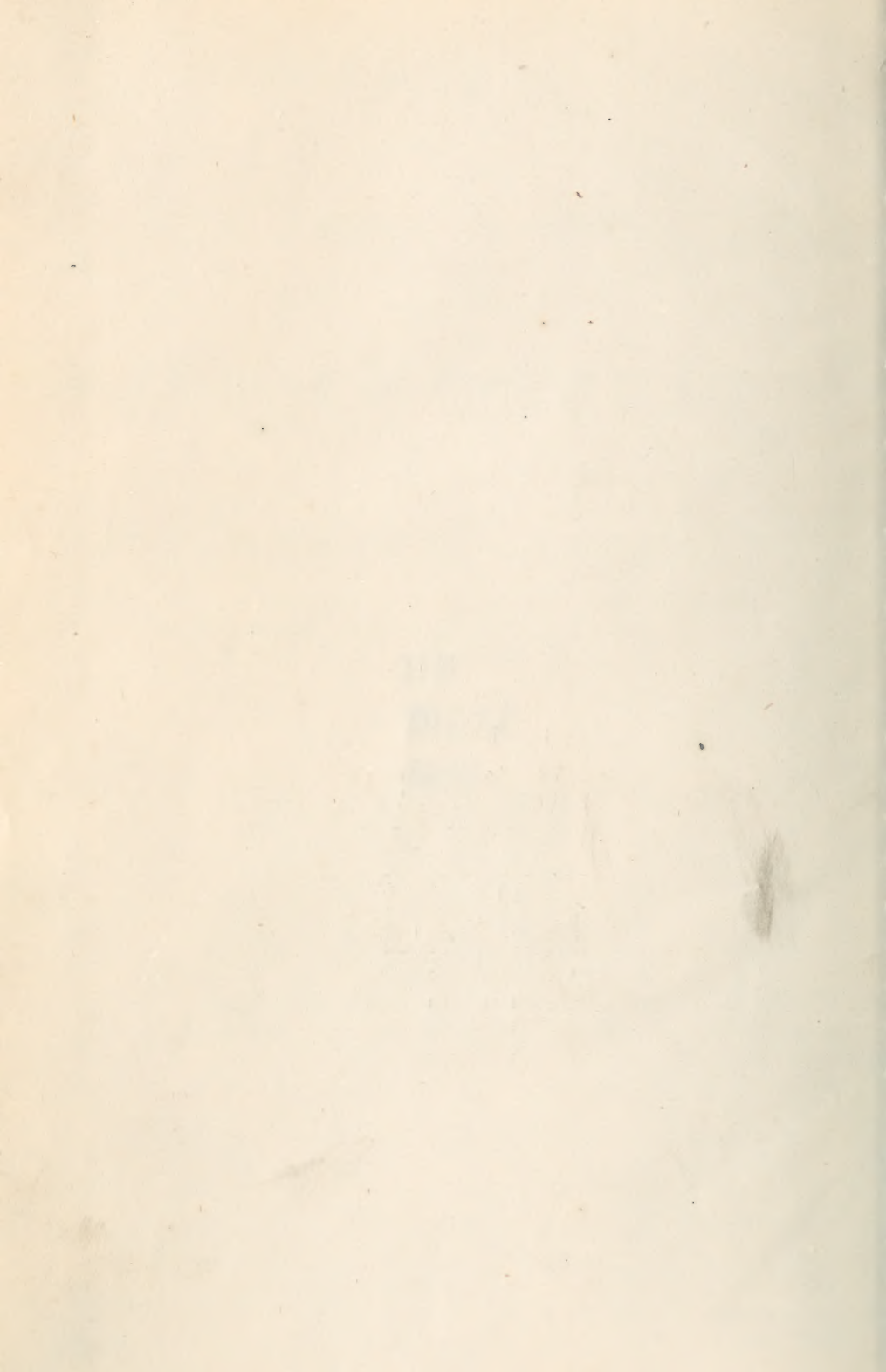
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1874.

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1874



BIRTHS.

The total number of births returned as having occurred in the State of Michigan during the year 1870 was 26,663.

The average number of births during specified periods of time was as follows:

Average number per quarter.....	6,665.75
Average number per month.....	2,221.91
Average number per week.....	512.75
Average number per day.....	73.04

The actual number and per cent of births returned which occurred in each quarter of the year, is shown in Table I., which also allows of comparison, by number and per cent of total, with each quarter in the two preceding years.

TABLE I.

Births, by Quarters of the Year, showing the number and per cent of totals, for the Years 1868, 1869, and 1870.

QUARTERS ENDING WITH.	1868.		1869.		1870.	
	Number.	Per cent of total.	Number.	Per cent of total.	Number.	Per cent of total.
March.....	5,501	21.98	5,415	19.98	5,440	20.40
June.....	5,909	23.61	6,348	23.43	6,491	24.34
September.....	6,924	27.67	7,883	29.09	7,500	28.12
December.....	6,628	26.49	7,381	27.24	7,100	26.62
Unknown.....	58	.23	66	.24	132	.49
Total.....	25,020	100.00	27,093	100.00	26,663	100.00
Average.....	6,255	25.00	6,774	25.00	6,665	25.00

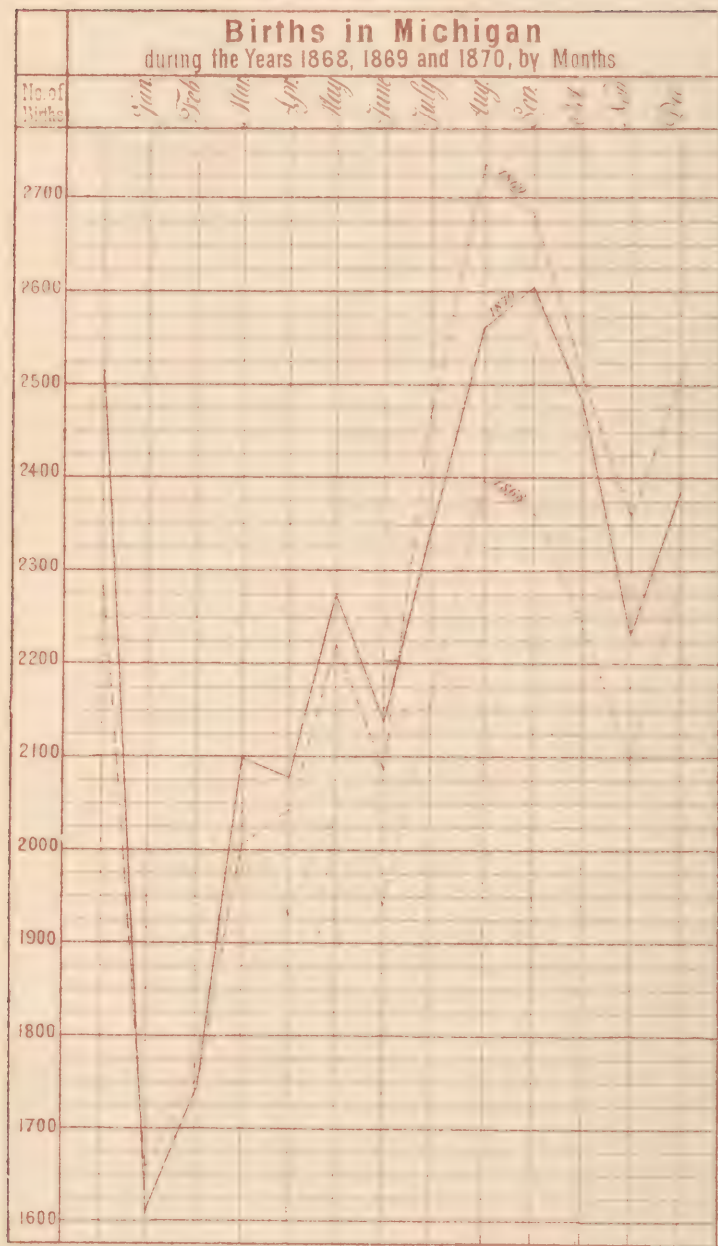
^a See notes to month of April and Unknown, in Table II.

^b The number in unknown quarter of year included.

The order of greatest number of births by quarters of the year was the same in 1870 as in the two preceding years; the greatest number occurring in the third, then the fourth, second, and least of all in the first quarter. This was precisely the order in which they were reported in Massachusetts in 1869, and is similar to the order in which they usually occur in that State, although the number sometimes regularly increases until the last quarter. In this State, as in Massachusetts, a much greater number occur in the two last, than in the two first quarters. The birth-rate for the different seasons of the year can be more closely studied by referring to Table II., which shows the number in each month for the years 1868, 1869, and 1870. For the more ready comparison of the rate in each year, the months have been arranged in order by number, the one in which the greatest number occurred first in every case.

In any given section of country the proportion of births in each part of the year is nearly the same in every year. This is found to be true in this State, so far as records have been collected, as will be readily seen by Table II., and is perhaps more forcibly shown by Diagram No. 1. In the line in the diagram representing births in 1868, there appeared to be an exception in the month of April. This led to further examination, when it was found that the number of births in April, 1868, stated in the Second Registration Report, only represented twenty-five days, the births in the first five days having been omitted in some way, because the first collection year was made by law to end April 5th, and the year 1868 to begin at that time. By adding births for five days at the same rate shown for the twenty-five days, the number is increased to 1,928, which is something near the proportion for April in the other two years. The line for births, 1868, on Diagram No. 1, shows the births for that month as first compiled, and also with this estimated correction.

DIAGRAM N^o 1.



Designed by H.B. Bak - M.D.

TABLE II.

Births by Months, arranged in order, by Number, for the Years 1868, 1869, and 1870.

ORDER.	1868.			1869.			1870.		
	Months.	No.	Per ct. of Total	Months.	No.	Per ct. of Total	Months.	No.	Per ct. of Total
	Total..	25,020	100.00	Total..	27,093	100.00	Total..	26,663	100.00
1	August...	2,399	9.58	August...	2,731	10.08	Sept.....	2,602	9.75
2	Sept.....	2,302	9.44	Sept.....	2,681	9.89	August...	2,559	9.59
3	Dec.....	2,283	9.12	Dec.....	2,512	9.27	October..	2,480	9.30
4	Oct.....	2,246	8.97	Oct.....	2,503	9.22	Dec.....	2,387	8.95
5	July.....	2,163	8.64	July.....	2,471	9.12	July.....	2,339	8.77
6	Nov.....	2,099	8.38	Nov.....	2,361	8.71	May.....	2,275	8.53
7	March...	2,043	8.16	May.....	2,221	8.19	Nov.....	2,223	8.37
8	May.....	2,037	8.10	June.....	2,085	7.69	June.....	2,140	8.02
9	June.....	1,944	7.76	April.....	2,042	7.53	March....	2,099	7.87
10	April ^a ...	1,928	7.70	March.... ^b	2,005	7.40	April.....	2,076	7.73
11	Feb.....	1,759	7.03	Feb.....	1,752	6.46	February..	1,737	6.51
12	January..	1,699	6.79	January..	1,658	6.11	January..	1,604	6.01
	Unkn ^b ..	58	.23	Unkn ^b ..	66	.24	Unkn ^b ..	132	.49
	Average..	2,085	8.33	Average..	2,257.75	8.33	Average..	2,221.91	8.33

^a The number of births in April, 1868, as published in the Second Registration Report, was 1,697; but this number only represented twenty-five days, as will be explained elsewhere. Thirty days, at the same rate, would give the number stated in this Table.

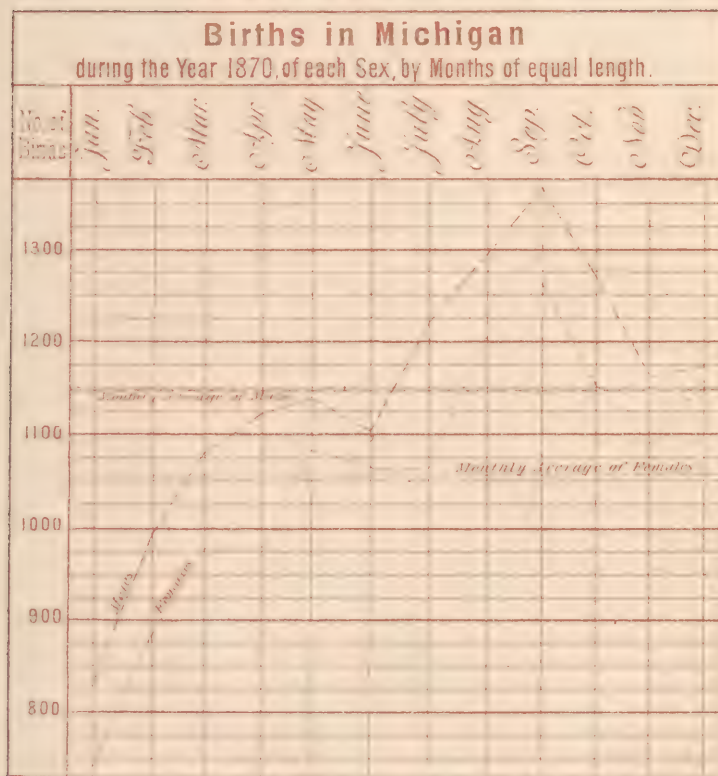
^b This number was obtained by adding three-twelfths of the number of births in unknown months stated in the First Registration Report, to the whole number stated in the second Report, which was for the remaining nine months of the year 1868.

An interesting question has been discussed by statisticians, as to the controlling causes of the nearly constant proportion of births in the various seasons. Dr. Derby, who has had editorial charge of the Registration Reports of Massachusetts since 1865, concludes that "It does not seem to depend upon physiological causes, as in the lower animals, but rather upon custom, religious observances, and occupations. The great number of marriages which take place in Massachusetts about Thanksgiving and in the early winter, doubtless influence it."

Again, in the Report for 1870, in explanation of the cause of the greater number of births in the last two quarters of the year, he says: "The enforced separation of husbands from their wives at certain seasons of the year, in order that the occupations of seamen, of fishermen, of laborers, etc., may be pursued, are still operative." He is influenced in forming and maintaining these opinions, by the fact that in England, during the seven years, 1860 to 1866, inclusive, 51.7 per cent of the annual births occurred in the first half of the year. Even though the relation between the seasons be different in different countries, the uniformity of proportion of births in each season in the same locality indicates the action of fixed natural laws, which can be determined by sufficient comparison and study of statistics, collected for a proper length of time. Whether the causes be mainly physiological or sociological, they are evidently acting year after year, and their expression can therefore, in all probability, be reduced to general laws.

In searching for the prominent cause of this uniformity of birth-rate by seasons of the year, the first comparison suggested is with the time of the greatest and least number of marriages. If to the bottom of Diagram No. 2 there be added the months of conception, beginning with April under the first line for January, and placing the months following in the natural order, ending with March under the line for December, the births can then be compared by months of conception with the monthly marriages shown in Diagram No. 3. The birth-rate being uniform by seasons of the different years, if the greater or less than average proportion at certain seasons is mainly dependent upon the marriage-rate, that also must be uniform by seasons, and correspond in some way by proportionate number with the months of conception. Diagram No. 3 shows that the marriage-rate for different years in this State is remarkably uniform by months. The exceptions to uniformity there shown for the first part of the year 1868, and for the last part of the year 1870, were without doubt due to deficient

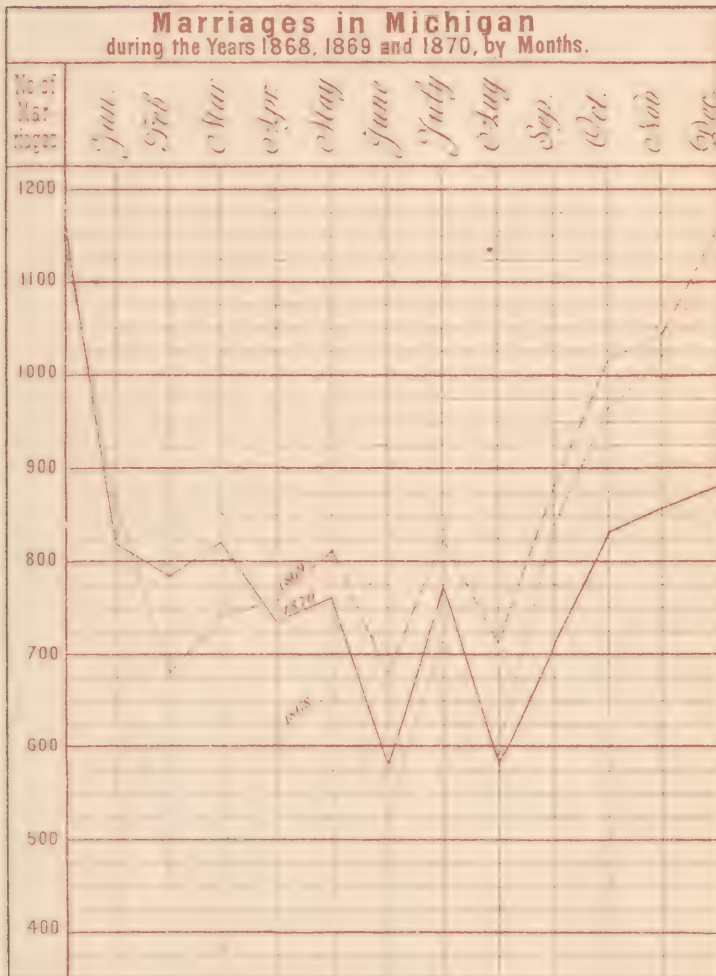
DIAGRAM N^o 2.



Designed by W. B. Snow, M.D.



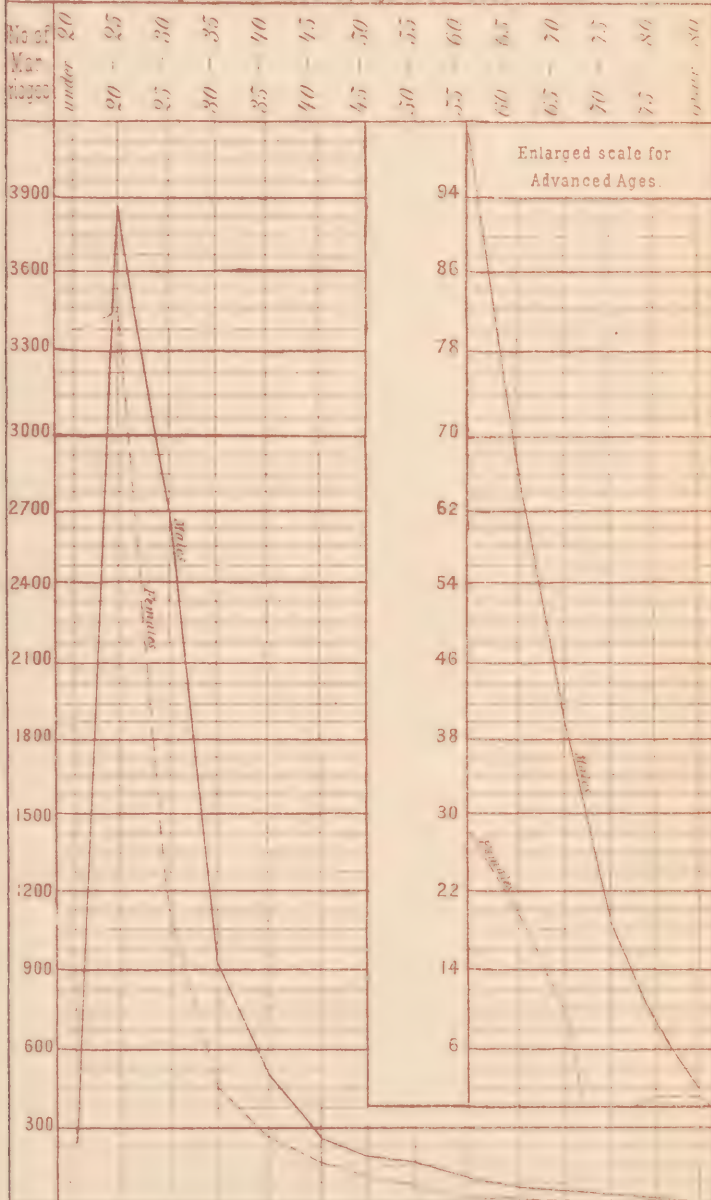
DIAGRAM NO 3.



Designed by H.B. Baker, M.D.

DIAGRAM N^o 4.

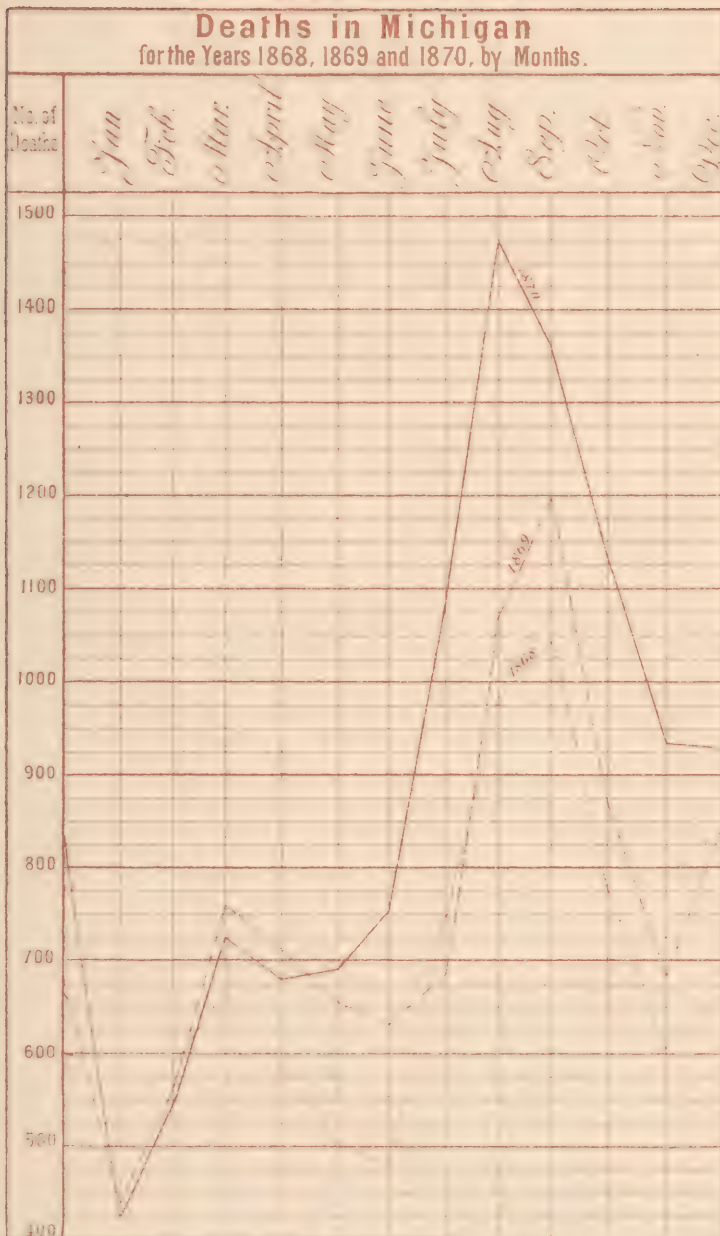
Marriages in Michigan
during the Year 1870, by Age in Periods of Years.



Designed by H.B. Baker, M.D.

DIAGRAM No 5.

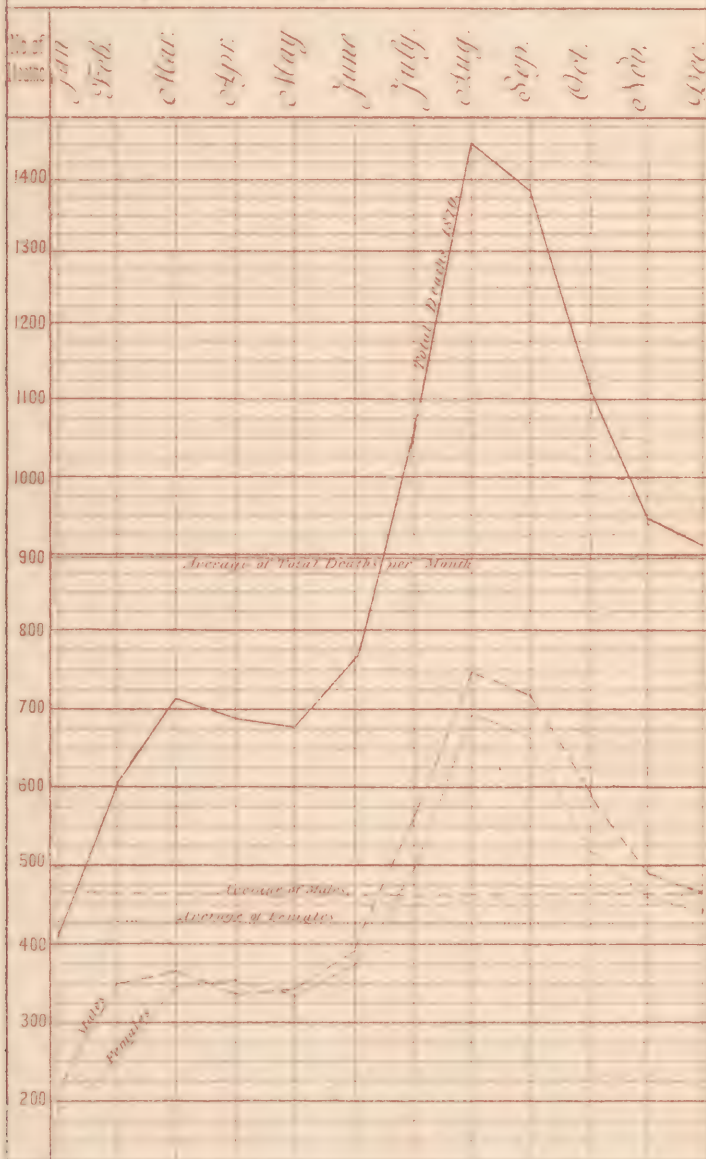
Deaths in Michigan
for the Years 1868, 1869 and 1870, by Months.



Designed by H.B. Baker, M.D.

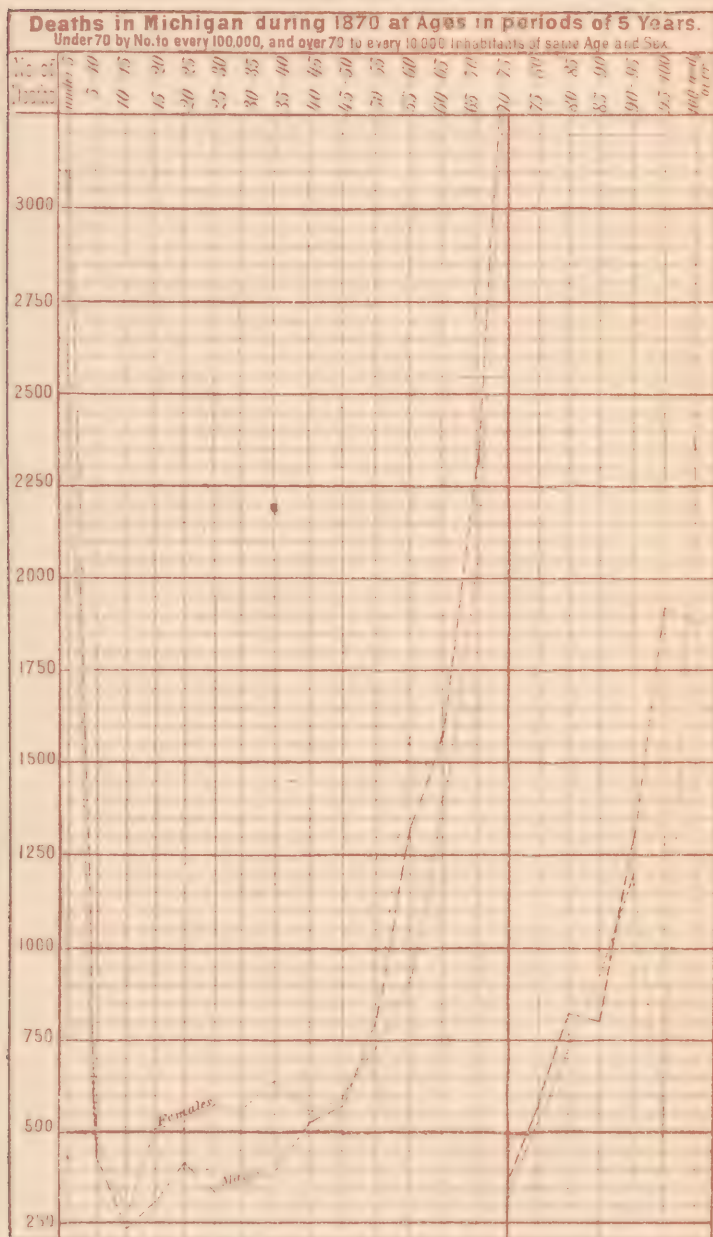
DIAGRAM N^o 6.

Deaths in Michigan
during the Year 1870, by Months made of equal length.



Designed by H.B. Baker, M.D.

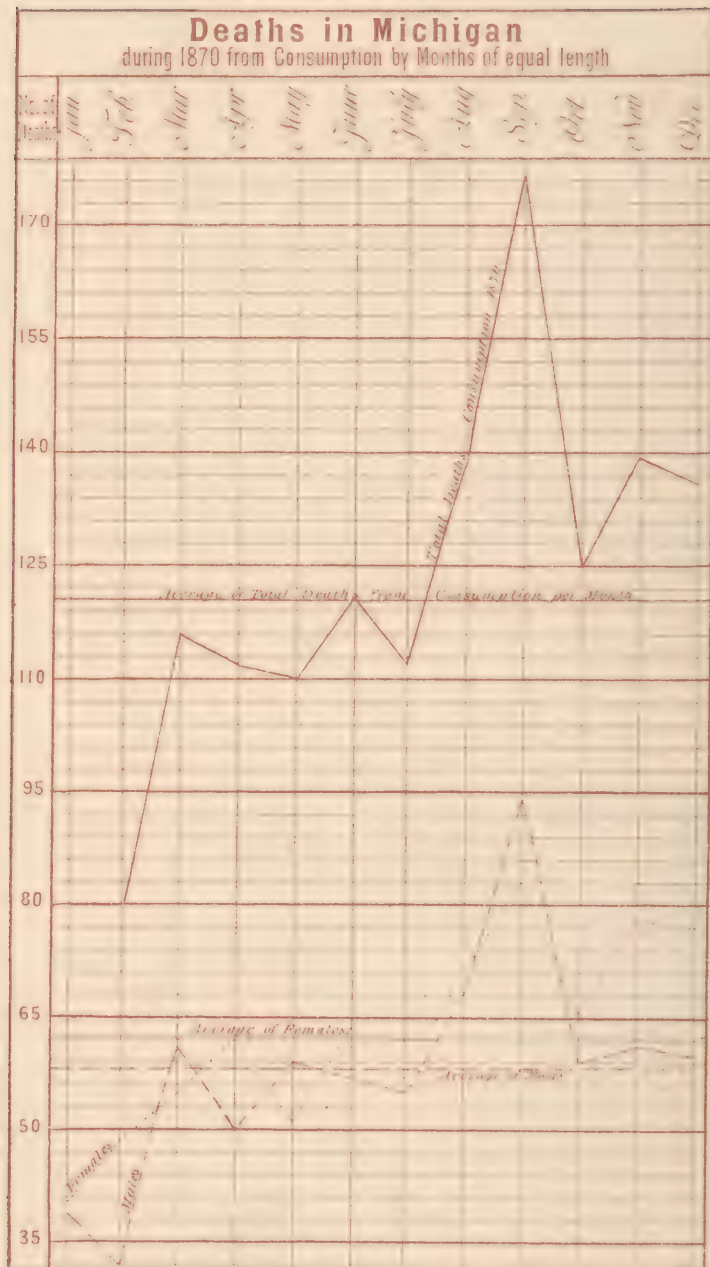
DIAGRAM N^o 8.



Designed by T. B. Folger N.Y.

DIAGRAM NO 7.

Deaths in Michigan during 1870 from Consumption by Months of equal length



— Prepared by H. A. Walker, M.D.

EXHIBIT L.

By Sex, the Number of Deaths in Michigan from Consumption during the Year 1870, by Months Equalized to Uniform Length of 30.44 Days each; and also the Average Numbers Per Month (Deaths of Unknown Sex, and in Unknown Months, Excluded.)

		MONTHS OF EQUAL LENGTH.												
	Year.	January.	February.	March.	April.	May.	June.	July.	August.	Septemb'r.	October.	November.	December.	Average.
Totals.....	1447	80	80	116	112	110	121	112	189	177	125	139	136	120.54
Males.....	695	39	32	61	50	59	57	55	68	94	59	61	60	57.91
Females.....	752	40	49	55	62	51	63	57	71	83	66	78	77	62.65

Pneumonia.—Before concluding the examination of the causes of death from Consumption, it seems advisable to take up the subject of Pneumonia, and then continue the study of both together.

Notwithstanding there was an increased number of deaths returned from Consumption and from all causes combined, the whole number of deaths returned as having occurred during the year 1870 from Pneumonia was 376, which was 151 less than for 1869. The relation of deaths from Pneumonia to deaths from all causes, was, in 1869, 4.66 per cent; in 1870 it was 3.49 per cent.

In last report it was shown that there was a correlation between Consumption and Pneumonia,—that under circumstances and conditions where there was more than the average mortality from one disease, there was likely to be less than the average from the other. The subject will be still further examined in this report, beginning with Table XXII.

TABLE XXII.

Correlation of Consumption and Pneumonia. Deaths from Consumption and Pneumonia in Michigan during the Year 1870, by Months, Exhibiting the Total Number, Number of Each Sex, Per Cent of Total, and Excess of each Sex.

MONTHS.	CONSUMPTION.										PNEUMONIA.					
	NUMBER.					PER CENT OF EACH SEX TO TOTAL OF BOTH SEXES.					NUMBER.			PER CENT OF EACH SEX TO TOTAL OF BOTH SEXES.		
	Males.	Females.	Unknown.	Total.	Per Cent of Deaths in Each Month to Total for Year. <i>a</i>	Males.	Females.	Excess.			Males.	Females.	Excess.	Males.	Females.	Excess.
Year 1870.....	607	753	1	1,461	.....	48.03	51.96	.....	3.87	219	157	876	.....	58.24	41.75	16.49
January.....	40	41	.....	81	5.59	49.38	50.61	.....	1.23	14	8	22	5.96	63.63	36.36	27.27
February.....	<i>d</i> 20	<i>f</i> 45	.....	74	<i>b</i> 5.11	89.18	60.81	.....	21.63	<i>d</i> 30	<i>f</i> 16	46	<i>b</i> 12.23	65.21	34.78	30.48
March.....	62	<i>f</i> 56	.....	118	<i>b</i> 8.15	52.54	47.45	5.09	.....	27	<i>f</i> 16	43	<i>b</i> 11.46	62.79	37.20	25.39
April.....	49	61	.....	110	7.60	44.54	55.45	.....	10.91	12	12	24	6.40	50.00	50.00	.....
May.....	<i>e</i> 60	52	.....	112	7.74	53.57	46.42	7.15	.....	<i>e</i> 14	10	24	6.40	53.33	46.66	16.67
June.....	56	62	.....	118	8.15	47.45	52.54	.....	5.09	14	13	27	7.20	51.85	48.14	3.71

July.....	56	58	114	7.57	49.12	50.87	1.73	7	10	17	4.53	41.17	58.82	.....	17.65
August.....	e 69	g 73	142	c 9.81	48.80	51.40	h	e 12	g 11	23	c 6.18	52.17	47.82	4.85	h
September.....	e 93	g 82	115	c 12.09	53.14	46.85	0.29	h	g 11	20	c 5.88	45.00	55.00	h	10.00
October.....	e 60	67	127	c 8.77	47.24	52.75	.....	5.51	e 18	14	c 7.20	48.14	51.85	.....	8.71
November.....	60	77	137	9.46	43.79	56.20	h	12.41	27	14	41	10.93	65.85	84.14	h
December.....	' 61	78	139	9.60	43.88	56.11	h	12.23	39	22	61	16.20	63.93	86.06	h
Unknown.....	2	1	4	.....	66.66	33.33	.....	.....	1	.....	1	100.00	.....	100.00	.....
Average a.....	57.31	62.66	120.57	8.83	48.08	51.96	.....	3.93	18.16	31.24	8.33	58.18	41.86	16.27	.....

a Unknown month excluded.

b Months in which there was less than the average proportion of deaths from Consumption, and more than the average from Pneumonia.

c Months in which there was more than the average proportion of deaths from Consumption, and less than the average from Pneumonia.

d Months in which there were less than the average number of deaths of males from Consumption, and more than the average number of deaths of males from Pneumonia.

e Months in which there were more than the average number of deaths of males from Consumption, and less than the average from Pneumonia.

f Months in which there were less than the average number of deaths of females from Consumption, and more than the average from Pneumonia.

g Months in which there were more than the average number of deaths of females from Consumption, and less than the average from Pneumonia.

h Seven out of eleven months in which there was an excess of deaths of one sex from Consumption, and of the opposite sex from Pneumonia. In April there was an excess of deaths of females from Consumption, and an equal number of each sex from Pneumonia.

EXHIBIT M.

*Deaths from Consumption in Michigan during the Year 1870,
and some Meteorological Conditions existing at the Same
Time.*

MONTHS IN ORDER BY NUMBER OF DEATHS FROM CONSUMPTION.	DEATHS.		Thermometer—F. Mean of 3 Daily Observations, 9 A. M., 2 P. M., and 9 P. M.		Humidity of Atmosphere, etc. Monthly Averages.						
	Number.	Per Cent of Total.	RANGE.		Temperature.	Relative Humidity, or Per Cent of Saturation.	Force or Pressure of Vapor, in Inches.	Weight, in Grains, of Vapor in Cubic Foot of Air. <i>a</i>	Weight, in Ounces, Troy, of Vapor Inhaled by one person in 24 Hours. <i>a</i>	Weight, in Ounces, Troy, of Vapor Exhaled from Air Passages, in 24 Hours, in Excess of Vapor Inhaled. <i>a</i>	
			Daily.	From Day to Day, 2 P. M. to 2 P. M.							
Year 1870.....	1,447	100.00	17.11°	19.08°	49.10°	81	.341	8.90	2.43	9.24	
More than Av. No. of Deaths.	September.....	175	12.09	22.90°	25.03°	63.66°	83	.490	5.45	3.40	8.27
	August.....	142	9.81	18.22	19.06	50.11	81	.594	6.54	4.08	7.50
	December.....	180	9.60	9.03	10.58	24.80	94	.189	1.70	0 1.06	10.61
	November.....	137	9.46	19.96	21.36	38.40	80	.187	2.22	0 1.88	10.29
	October.....	127	8.77	16.45	18.29	52.45	85	.346	3.95	2.46	9.21
Less than Average No. of Deaths.	June.....	118	8.15	19.50	21.56	70.87	77	.588	6.45	0 4.08	7.65
	March.....	118	8.15	14.58	16.43	20.28	84	.148	1.76	1.10	10.58
	July.....	114	7.87	17.92	19.32	54.40	79	.639	7.19	0 4.49	7.13
	May.....	112	7.74	20.98	23.22	64.32	73	.441	4.92	0 3.07	8.60
	April.....	110	7.60	17.50	19.96	50.99	76	.267	3.06	1.91	9.76
	January.....	81	5.59	18.41	15.70	25.37	85	.125	1.50	.03	10.74
	February.....	74	5.11	15.46	17.89	24.25	84	.112	1.35	.84	10.83
Average Month.....	120.58	8.93	17.11	19.08	49.10	81	.341	8.94	2.43	9.24	

a See foot-notes to "Exhibit I," page 301.

b Exceptions to rule that more than an average amount of vapor was inhaled in months in which there were more than an average number of deaths from Consumption, and less than the average amount in months in which less than the average number of deaths occurred.

EXHIBIT N.

*Deaths from Pneumonia, in Michigan, during the Year 1870,
and some Meteorological Conditions existing at the Same Time.*

MONTHS IN ORDER BY NUMBER OF DEATHS FROM PNEUMONIA.			DEATHS.		Thermometer—F. Mean of 8 Daily Observations, 9 A. M., 2 P. M., and 9 P. M.		Humidity of Atmosphere, etc. Monthly Averages.					
			Number.	Per Cent of Total.	RANGE.		Temperature.	Relative Humidity, or Per Cent of Saturation.	Force or Pressure of Vapor, in Inches.	Weight, in Grains, of Vapor in Cubic Foot of Air. <i>a</i>	Weight, in Ounces, Troy, of Vapor Inhaled by one Person in 24 Hours. <i>a</i>	Weight, in Ounces, Troy, of Vapor Exhaled from Air Passages in 24 Hours, in Excess of Vapor Inhaled. <i>a</i>
					Daily.	From Day to Day, 2 P. M. to 2 P. M.						
Year 1870.....	875	100.00	17.11°	19.08°	49.10°	81	.841	8.90	2.48	9.24		
More than av. No. of Deaths.	December..	61	16.26	9.03°	10.58°	24.80°	94	.180	1.70	1.06	10.61	
	February..	46	12.26	15.46	17.80	24.25	84	.112	1.35	.84	10.66	
	March.....	48	11.46	14.58	16.48	30.28	84	.148	1.76	1.10	10.58	
	November..	41	10.93	19.96	21.86	38.40	80	.187	2.22	1.88	10.29	
Less than average No. of Deaths.	October....	27	7.20	16.45	18.29	52.45	85	.846	8.95	2.46	9.21	
	June.....	27	7.20	19.50	21.56	70.87	77	.588	6.45	4.08	7.66	
	May.....	24	6.40	20.93	23.22	64.82	73	.441	4.92	3.07	8.60	
	April.....	24	6.40	17.50	19.06	50.30	76	.267	3.06	c 1.91	9.76	
	August.....	23	6.18	18.22	19.06	70.11	81	.594	6.54	4.08	7.50	
	January....	22	5.86	18.41	15.70	625.37	85	.125	1.50	c .93	10.74	
	September..	20	5.33	22.96	25.03	63.66	83	.400	5.45	2.40	8.27	
July.....	17	4.53	17.32	19.32	74.40	79	.659	7.19	4.49	7.18		
Average Month..		81.25	8.83	17.11	19.08	49.10	81	.841	8.94	2.48	9.24	

a See foot-notes to "Exhibit I," page 301.

b Exceptions to rule that the temperature was greater than the average in months in which less than the average number of deaths from Pneumonia occurred. The temperature was less than the average in every month in which there were more than the average number of deaths.

c Exceptions to rule that more than the average amount of vapor for the year was inhaled in months in which there were less than the average number of deaths from Pneumonia. There were no exceptions to the rule that less than the average amount of vapor was inhaled in months in which more than the average number of deaths occurred from this disease.

TABLE XXIII.

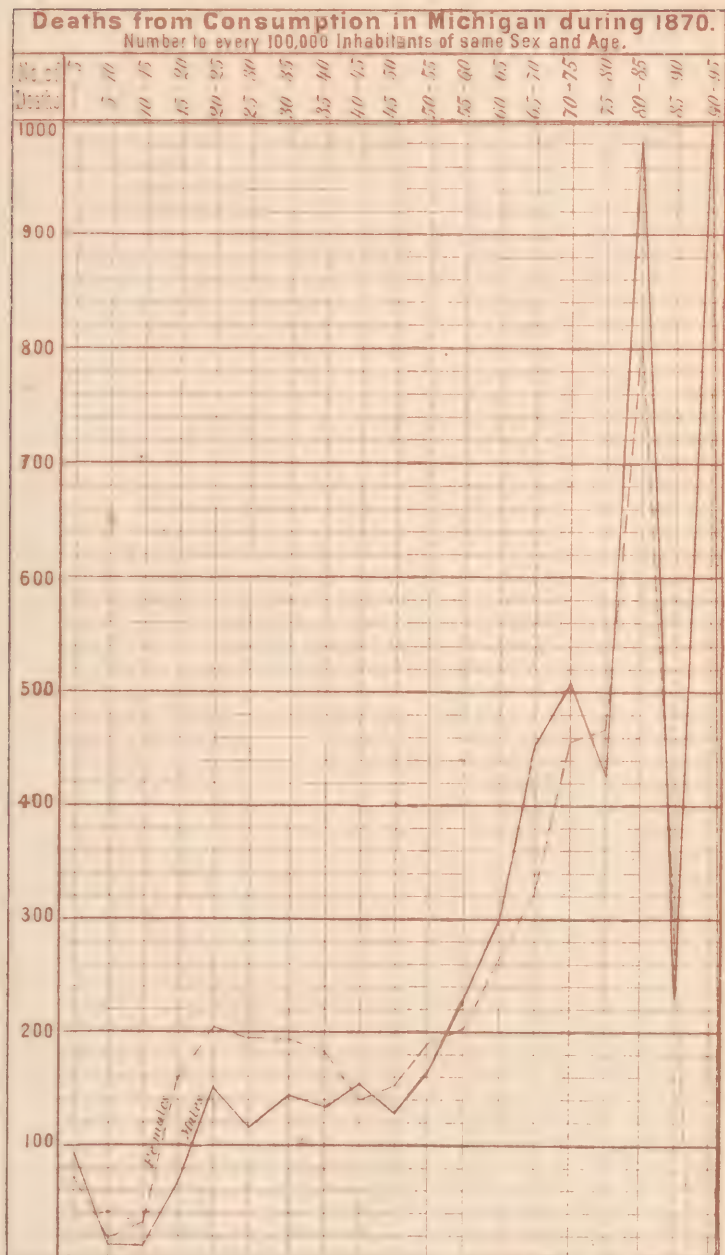
Exhibiting, by Sex, the Death-Rate and the Number of Deaths, at Each Period of Age, from Consumption, in Michigan during the Year 1870.

AGES.	PER CENT OF DEATHS TO POPULATION OF CORRESPONDING AGE AND SEX. <i>a</i>					NUMBER OF DEATHS.			
	Total.	Males.	Females.	EXCESS.		Total.	Males.	Females.	Unknown.
				Males.	Females.				
All Ages.....	.125	.116	.136	----	.020	1,451	697	753	1
Under 1	.243	.292	.193	.099	----	77	47	30	----
1 to 2.....	.113	.127	.099	.028	----	35	20	15	----
2 to 3.....	.080	.029	.087	----	.008	10	5	5	----
3 to 4.....	.021	.030	.012	.018	----	7	5	2	----
4 to 5.....	.019	.012	.026	----	.014	6	2	4	----
Under 5	.085	.097	.071	----	----	135	79	56	----
5 to 10.....	.014	.012	.017	----	.005	21	9	12	----
10 to 15.....	.020	.011	.029	----	.018	23	8	20	----
15 to 20.....	.113	.063	.159	----	.091	132	40	92	----
20 to 25.....	.178	.153	.205	----	.052	200	89	111	----
25 to 30.....	.153	.117	.192	----	.075	151	60	91	----
30 to 35.....	.167	.141	.192	----	.051	135	59	75	1
35 to 40.....	.172	.136	.184	----	.043	116	53	63	----
40 to 45.....	.145	.153	.137	.016	----	87	40	38	----
45 to 50.....	.139	.130	.151	----	.021	69	36	33	----
50 to 55.....	.175	.164	.190	----	.026	73	39	34	----
55 to 60.....	.217	.223	.201	.027	----	62	37	25	----
60 to 65.....	.233	.295	.267	.023	----	66	38	28	----
65 to 70.....	.394	.450	.323	.127	----	53	37	21	----
70 to 75.....	.433	.504	.456	.043	----	46	27	19	----
75 to 80.....	.443	.430	.469	----	.039	21	11	10	----
80 to 85.....	.397	.363	.300	.133	----	19	11	8	----
85 to 90.....	.253	.230	.230	----	.050	2	1	1	----
90 to 95.....	.320	1.000	----	1.000	----	1	1	----	----
95 to 100.....	----	----	----	----	----	----	----	----	----
100 and over.....	----	----	----	----	----	----	----	----	----
Unknown Ages.....	----	----	----	----	----	29	13	16	----

a Population only that of counties and townships represented by returns of deaths.

Disregarding the decimal points, the numbers in the third and fourth columns of Table XXIII. represent the number of

DIAGRAM NO 9.



(Designed by H.B. Baker M.D.)

deaths in every 100,000 inhabitants of each sex, at the several periods of age; and the same, beginning with all under five, is graphically represented in Diagram No. 9.

Table IV., page 129, and Diagram No. 8, facing it, exhibit similar statements concerning deaths from all causes. The two tables may be compared with each other; but the facts are more forcibly shown by the diagrams, and their comparison is more satisfactory, as they appeal to the sense of sight, and not to the imagination alone, as do the figures of the tables.

It will, doubtless, be a matter of surprise to many physicians to find the death-rate from Consumption after the age of fifty years, greater than the average, and increasing with the age; but so it appears from the returns. Although the number of deaths is greatest at the ages between twenty and twenty-five, the proportion of deaths of the whole number of inhabitants of the same age appears to be greatest in old age.

The per cent of total deaths from all causes to population was precisely the same for both sexes, being .930 per cent. The per cent of total deaths from Consumption to population was: males, .116; females, .136,—a difference of .020 per cent.

Out of 100 deaths from all causes, except Consumption and Pneumonia, there were 4.97 more males than females.

Out of 100 deaths from Consumption there were 3.87 more females than males.

Out of 100 deaths from Pneumonia there were 16.49 more males than females.

Making a difference between the proportion of deaths of the sexes from the two causes of 20.36 per cent. The excess per cent from Consumption being 8.84 more females, and the excess per cent from Pneumonia 11.52 more males than from all causes except these two.

This furnishes a marked illustration of the correlation of Consumption and Pneumonia, so far as concerns the sex of decedents. The relation between the two diseases at the different periods of age is shown in Table XXIV.

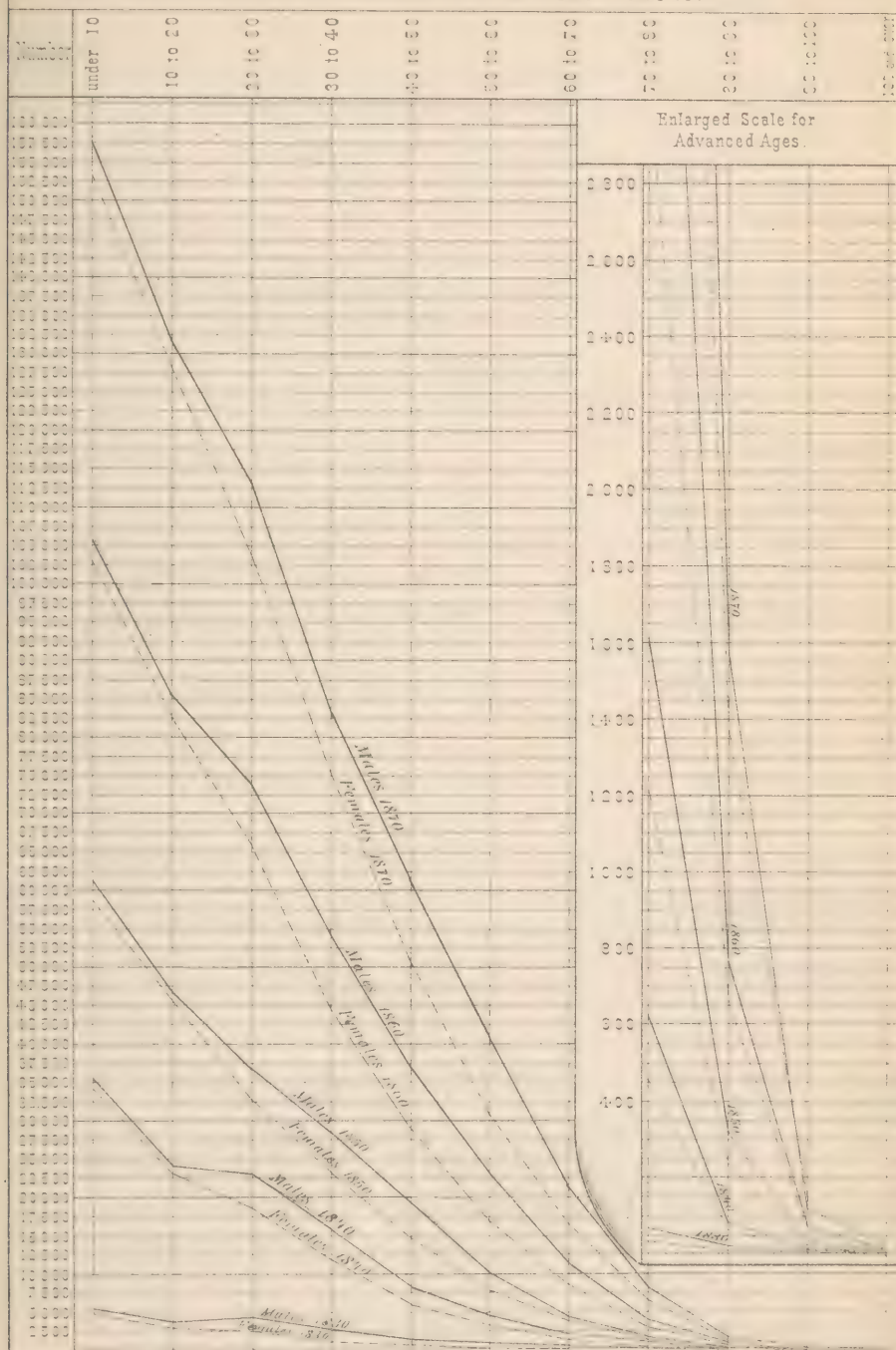
TABLE XXIV.

Correlation of Consumption and Pneumonia.—Exhibiting the Number and Per Cent of Deaths of Each Sex, the Difference between the Sexes, and the Per Cent of Total Deaths at Each Period of Age, from Consumption and Pneumonia in Michigan during the Year 1870.

AGE.	CONSUMPTION.							PNEUMONIA.							
	NUMBER.				PERCENTAGE OF THE SEXES. (UNKNOWN SEX EXCLUDED.)			NUMBER.				PERCENTAGE OF THE SEXES.			
	Males.	Females.	Unknown.	Total.	Per Cent of Deaths at Each Age to Deaths at All Ages. a	Excess.		Males.	Females.	Total.	Per Cent of Deaths at All Ages. a	Males.	Females.	Excess.	
						Males.	Females.								
All Ages.....	667	753	1	1,421	.....	48.06	51.93	.....	8.97	.....	376	53.24	41.75	10.49	.....
Under 5.....	79	56	.....	135	0.49	53.51	41.48	17.03	.....	.....	184	52.17	47.82	4.85	.....
5 to 10.....	9	12	.....	21	1.47	42.85	57.14	.....	14.29	.....	14	50.00	50.00	.....	.....
10 to 15.....	8	26	.....	28	1.96	28.57	71.42	.....	42.85	.....	4	50.00	50.00	.....	.....
15 to 20.....	240	292	.....	532	29.28	80.80	69.69	.....	89.89	.....	67	46.15	53.84	.....	7.69
20 to 30.....	249	202	.....	451	24.68	42.45	57.54	.....	15.09	.....	112	45.45	54.54	.....	9.09
30 to 40.....	112	188	1	301	17.63	41.80	58.20	.....	10.40	.....	12	41.66	58.33	.....	16.67
40 to 50.....	285	71	.....	356	19.97	54.48	45.51	8.97	.....	25	6.68	60.00	40.00	20.00	.....

DIAGRAM N^o 1.

Number of Inhabitants of each Sex, by Age in Periods of ten Years, in Michigan
at five U.S. Censuses - 1830 to 1870 inclusive.



It is somewhat important for statisticians who deal with vital statistics to recognize and keep such facts as these in mind, for to whatever cause this wave be attributed, the fact of its existence appears indisputable. At the next decennial Census, in 1880, it will undoubtedly show itself in the very small number of inhabitants aged 100 and over, and unless the fact be kept in mind there will be much unnecessary alarm concerning the shortening of life as *apparently* shown by the decreasing proportion of inhabitants aged 100 and over.

Referring to the period of age at which the per cent. of increase was greatest, it may be remarked that persons now living at ages within that period were born within the years 1790 to 1800. On page 520 Mortality Vol. Eighth Census, 1860, attention is called to the historical fact of the great prosperity of this country at that time, that prosperity being somewhat dependent upon a memorable revolution commenced in France in 1789, which caused a demand for our exports, etc. The general prosperity of the country, as there pointed out, appears to have resulted in an influence upon the birth-rate noticeable in the population shown by all the Censuses of the United States since that time, increasing unusually the per cent. of increase from 1830 to 1840 of those aged 40 to 50, from 1840 to 1850 of those aged 50 to 60, from 1850 to 1860 of those aged 60 to 70. We have just seen from Table 3, that the population of Michigan still shows this wave in 1870, the greatest per cent. of increase since 1860 being of those aged 70 to 80, born during the historic period of prosperity referred to above.

Possibly there may be discovered a slight wave in the period 50 to 60, consisting in a comparatively small increase of both sexes, more especially of females, compared with the rate at 60 to 70, and 70 to 80. It seems quite possible that the influence of the conditions existing during the war of 1812 may be still apparent in the decreased number of inhabitants at certain ages resulting from a decrease in the birth-rate at that time. During, and after wars, there is popularly believed to be a larger proportion of births of males than of females.

The influence of the war of 1861-5 upon the birth-rate appears to be exhibited in the diminished increase of those aged 1 to 5, compared with the increase of those aged under 1, and 5 to 10,—ages including those born before and since the war. Here again the popular idea appears to receive support, for while of those aged 5 to 15 there was a larger increase of females than of males, of those aged under 5—born since the war—there was a larger increase of males than of females.

When remarking upon Exhibit A, reference was made to the late war as the cause of the diminished rate of total increase since 1860. Table 3 exhibits the fact that this decrease applied to females with almost as much force as to males, the difference in the rate of increase being only about 3 per cent. The idea received from this statement by itself should be somewhat modified, for we have seen that the increase of population by births immediately after wars includes a greater than ordinary proportion of males, or more correctly, the births of females are decreased in greater proportion than the births of males. The evidence of the tables on a kindred subject in "Vital Statistics of Michigan, 1870,"—see page 78,—was to the effect that "causes tending to increase the birth-rate, tend also to increase the proportion of female offspring." This same statement reversed will apply to the decrease of female offspring through war or any other cause tending to decrease the birth-rate. It appears then that the small per cent. of increase of females since 1860, which, without such explanation, seems surprising, is not altogether due to increased death-rate and to diminished immigration during the war, but may in part be attributed to a diminished birth-rate.

Just how much the total birth-rate was diminished during the late war cannot be easily shown, for the reason that at that time no registration of births was required by law, and an attempt to show it from these tables would involve more time and labor than can now be devoted to the subject; but some idea of the decrease in the rate may be gained by considering, first, that the per cent. of increase since 1860 of the total population at all ages, was undoubtedly diminished by the low birth-rate; second, that the per cent. of increase of males aged 1 to 5, fell short of the average increase of males at all ages by nearly 13 per cent., while the per cent. of increase of females aged 1 to 5, fell short of the average of all females by over 17 per cent.

A very instructive study can be pursued by computing the per cent. of increase of each sex at each period of age to the population at last Census within the next preceding period. This is a method of examination which will well exhibit the comparative losses within the different periods of age. The results thus obtained should be compared with those by the preceding method, and also with the death-rate, as ascertained by other methods. Tables 1, 2, and 3 supply the data for this study, and it is hoped that some persons will be sufficiently interested to make use of the material.

Diagram No. 2 exhibits the number and relative proportion of each sex living at ages within periods of five years each. Some of the material from which it was constructed is exhibited in Table 4, which also contains statements of the proportion of inhabitants and the proportion of each sex at different ages and groups of ages.

DIAGRAM N^o 2.

Total Males and total Female Population of Michigan June 1st 1870, by Ages in Periods of five Years Each.

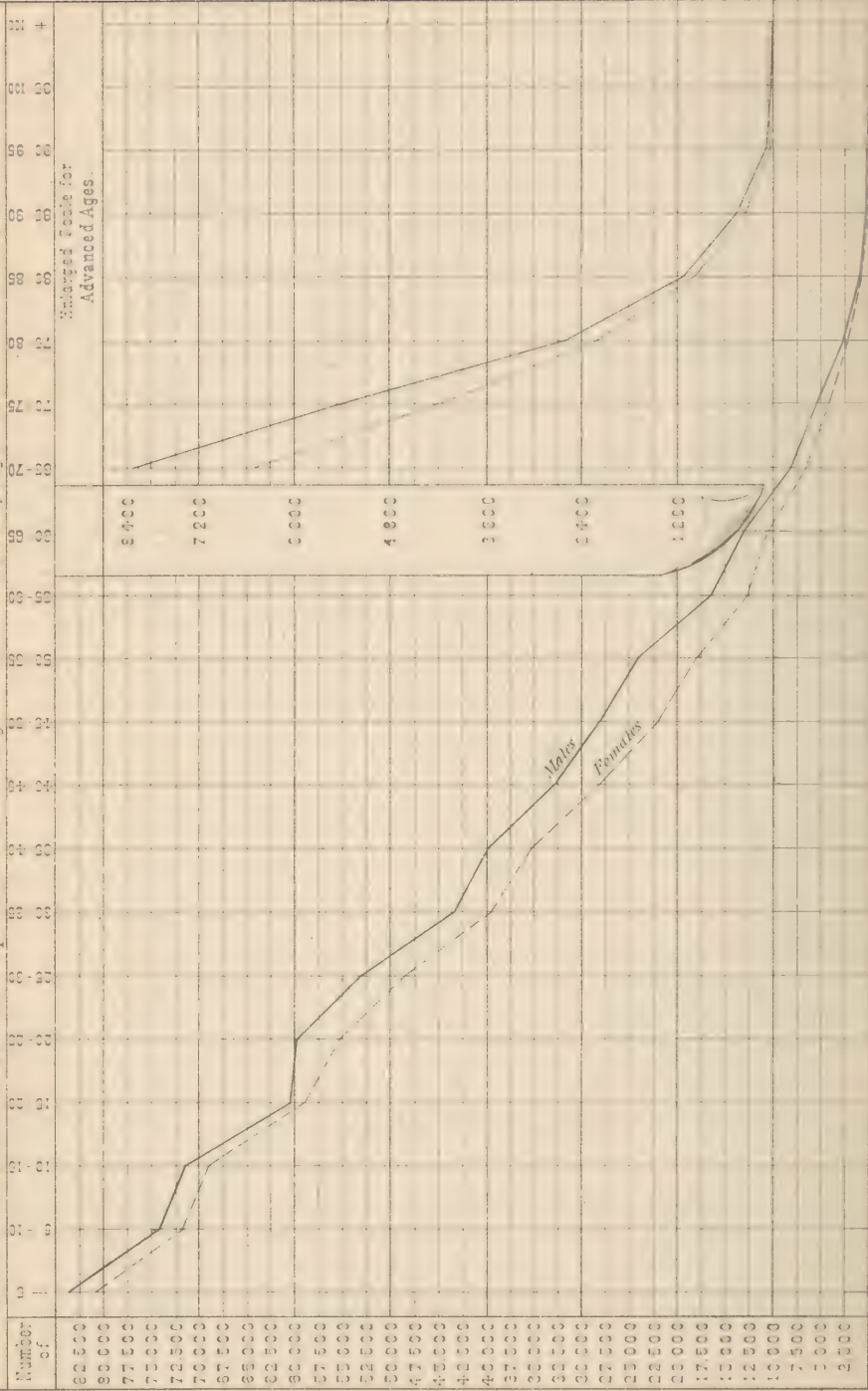


TABLE 4.—*Exhibiting, for each Sex and for both Sexes, the Total Population, by Age and by Periods of Age; the Number at each Age and Period of Age in 10,000 at All Ages, and at each Age and Period of Age, the Per Cent. of each Sex to Total of Both Sexes in Michigan, June 1st, 1870.*

AGES.	POPULATION JUNE 1ST, 1870.							
	TOTAL NUMBER.			NUMBER IN EACH AGE IN 10,000 AT ALL AGES. <i>a</i>			PER CENT. OF EACH SEX TO TOTAL OF BOTH SEXES.	
	Total.	Males.	Females.	Total.	Males.	Females.	Males.	Females.
ALL AGES.....	1,184,282	618,251	566,081	10,000	10,000	10,000	52.20	47.79
Under one.....	82,802	16,692	16,110	277	270	235	50.88	49.11
One to two.....	81,970	16,287	15,688	270	268	277	50.94	49.05
Two to three.....	84,174	17,462	16,712	289	282	295	51.09	48.90
Three to four.....	83,929	16,979	16,950	287	275	299	50.04	49.95
Four to five.....	81,414	16,099	15,815	266	260	271	51.24	48.75
Five to ten.....	146,827	74,149	72,178	1,286	1,199	1,275	50.67	49.32
Ten to fifteen.....	140,586	71,581	69,005	1,186	1,156	1,219	50.09	49.90
Fifteen to twenty.....	119,106	60,150	58,956	1,006	973	1,042	50.50	49.49
Twenty to twenty-five.....	115,186	59,947	55,239	973	970	976	52.04	47.95
Twenty-five to thirty.....	101,341	52,878	48,463	856	857	856	52.17	47.82
Thirty to thirty-five.....	83,257	43,280	39,977	703	700	706	51.98	48.01
Thirty-five to forty.....	75,035	39,975	35,060	684	647	619	53.27	46.72
Forty to forty-five.....	61,013	32,729	28,284	515	529	500	53.64	46.35
Forty-five to fifty.....	50,348	28,181	22,167	425	456	392	55.97	44.02
Fifty to sixty.....	71,277	40,566	30,711	601	655	543	56.91	43.08
Sixty to seventy.....	38,538	21,857	17,181	325	345	304	55.41	44.58
Seventy to eighty.....	14,865	8,008	6,857	121	129	112	53.74	46.25
Eighty to ninety.....	2,954	1,574	1,380	25	25	24	53.28	46.71
Ninety to one hundred.....	264	129	195	2	2	2	48.86	51.18
One hundred and over.....	33	16	17	.27	.25	.30	43.48	51.51
Unknown.....	868	212	151	3	3	3	53.40	41.59

DIAGRAMS.

Inasmuch as some who will receive this volume may not be familiar with the graphic method of illustration, or may not readily understand the principle of construction of these diagrams, it is remarked that they are employed to exhibit, as a chart or picture, certain statistical facts which otherwise, if displayed at all, would have to be conceived by the unaided imagination from tables, or figures, standing as symbols of the facts designed to be set forth.

a When the fraction was .5 or over, it was called 1; if under .5 it was thrown away, except at age "100 and over."

These diagrams are constructed as follows: As a rule, only one series of numbers is used for all the statements in a diagram. The numbers are placed on the left side, the smallest at the bottom, and they increase according to a regular scale from the bottom to the top of the diagram. The statements exhibited in the smallest numbers are consequently nearest the bottom, and the relative distance of the different parts of the line, or of different lines up from the bottom of the diagram, conveys a correct idea of the relative numbers represented at different months, ages, etc., which are designated by words or figures written over the tops of the perpendicular lines. For instance, if it is desired to exhibit, as is done in Diagram No. 3, the number of male inhabitants at each age in years, as under 1, 1, 2, 3, 4, 5, 6, etc., these figures are written at the top of the diagram, each figure over a perpendicular line. The series of numbers is placed on the left, beginning at the bottom with the smallest one required. These numbers are opposite horizontal lines to which they apply all the way across the diagram. The line representing the male inhabitants is then begun on the first perpendicular line designated as the age "Under 1," at such a height from the bottom of the diagram as is opposite the figures on the left expressing the number of males at such age. The line then proceeds directly to the next perpendicular line under the figure 1, crossing it precisely opposite the figures on the left expressing the number at that age, and proceeds in a similar manner across the diagram until the number at every age is exhibited.

The diagrams being drawn to scale, they convey an idea which, while it is much more distinct and comprehensive than the unaided imagination can conceive from the figures alone, is at the same time nearly as accurate in details, although for purposes of comparison by precise numbers it is advisable to employ the statements in the tables.

By means of these diagrams a great number of distinct statements can be exhibited within a space so limited as that all of them shall be visible at one time, thus giving an idea of the various relations which exist between the several statements; as, for instance, in Diagram No. 2 may be seen a statement of the number of inhabitants of each sex living at each group of ages within every quinquennial period of life. That knowledge in detail could be better gained from the tables, but in the diagram may also be seen at a glance the relative number and proportion of each sex at each period of age and the relation which the number and proportion of each sex at each period of age bears to the number and proportion of each sex at each and every other period of age; a view at once so distinct and at the same time so complex and comprehensive as to transcend the results attained by the best trained intellect without the aid received through the eye by means of some such graphic illustration.

DIAGRAM N° 3.

Total Male Population of Michigan in 1870, at every Age in Years.

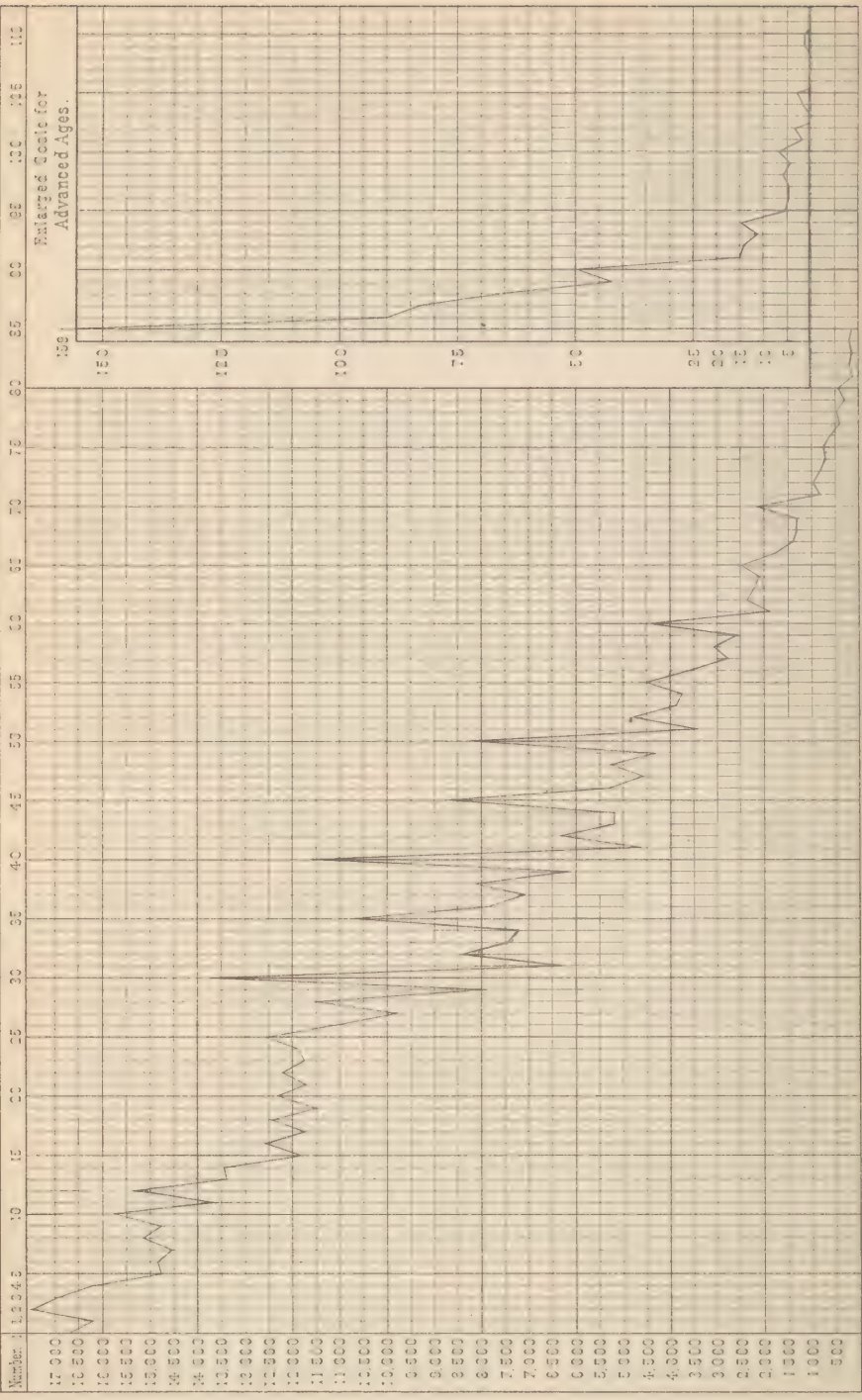


TABLE 5.—Exhibiting the Total Number of Males, and the Total Number of both Sexes in Michigan June 1st, 1870, at each and every age, in years for those aged One Year and Over, and at every age in Months for those aged Under One Year.

AGES.....	0-12	1-12	2-12	3-12	4-12	5-12	6-12	7-12	8-12	9-12	10-12	11-12	Under 1	1	2	3	4	5
Males.....	130	1,999	1,577	1,757	1,660	1,445	1,708	1,882	1,880	1,898	1,224	782	16,692	16,287	17,462	16,979	16,099	14,784
Both Sexes.....	248	3,967	3,208	3,467	3,164	2,881	3,520	2,650	3,044	2,782	2,415	1,511	32,802	31,970	34,174	33,939	31,414	29,091

AGES.....	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Males.....	14,843	14,852	15,198	14,767	15,751	18,081	15,864	18,408	18,477	11,813	12,585	11,759	12,459	11,504	12,385	11,775	12,209	11,794
Both Sexes.....	29,555	28,372	30,011	28,798	30,459	27,002	30,052	26,660	26,413	23,523	25,079	23,083	25,196	22,220	24,738	21,688	23,595	22,411

AGES.....	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Males.....	11,584	12,229	11,019	9,821	11,511	7,998	18,754	6,288	8,471	7,474	7,263	10,750	7,866	7,067	8,111	6,161	11,544	4,569
Both Sexes.....	22,809	24,718	21,488	18,873	21,926	15,886	26,587	12,256	16,582	14,717	14,165	19,359	15,883	18,429	15,355	11,559	20,684	8,929

AGES.....	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
Males.....	6,293	5,149	5,174	8,694	5,866	4,565	5,280	4,825	8,246	8,448	4,712	3,988	3,791	4,807	3,577	2,757	3,039	2,536
Both Sexes.....	11,798	9,930	10,066	14,838	9,649	8,840	9,681	7,875	14,193	6,092	8,246	6,923	6,820	7,791	6,883	4,894	4,518	

AGES.....	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77
Males.....	4,418	1,913	2,883	2,248	2,076	2,400	1,798	1,450	1,893	1,318	2,137	799	910	888	798	789	587	478
Both Sexes.....	8,060	3,431	4,291	4,017	3,844	4,413	3,167	2,921	2,469	2,223	3,771	1,832	1,665	1,505	1,308	1,366	1,049	886

AGES.....	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
Males.....	494	292	420	160	183	181	190	159	90	63	65	48	46	15	14	11	15	6
Both Sexes.....	892	541	751	311	368	351	388	264	169	153	119	95	91	27	80	25	24	17

AGES.....	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	Unk'n.		
Males.....	5	5	6	4	7	1	8	-----	1	2	-----	-----	-----	1	1	1	212	-----
Both Sexes.....	21	0	11	9	19	2	4	-----	1	4	-----	-----	-----	1	1	1	368	-----

TABLE 6.—Exhibiting the Total Number of Females, and the Total Number of Both Sexes, in Michigan, June 1st, 1870, at each and every age, in Years for those aged One Year and over, and at every age in Months for those aged Under One Year.

AGES.....	0-12	1-12	2-12	3-12	4-12	5-12	6-12	7-12	8-12	9-12	10-12	11-12	Under 1	1	2	3	4	5
Females.....	198	1,963	1,696	1,650	1,504	1,436	1,752	1,998	1,484	1,934	1,191	739	16,110	15,688	16,712	16,050	15,315	14,807
Both Sexes.....	248	3,967	3,203	3,467	3,104	2,881	3,520	2,650	3,044	2,782	2,415	1,511	32,802	31,970	34,144	33,929	31,414	30,601

AGES.....	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Females.....	14,701	14,820	14,813	14,031	14,708	13,421	14,088	13,252	12,986	11,715	12,494	11,324	12,707	10,716	12,393	9,868	11,856	10,617
Both Sexes.....	29,365	28,572	30,011	28,198	30,459	27,092	30,092	26,060	26,413	23,528	25,019	23,053	25,196	22,220	24,188	21,688	26,595	25,411

AGES.....	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Females.....	10,975	11,189	10,469	9,052	10,415	7,893	11,733	5,963	8,111	7,243	6,902	8,609	7,467	6,362	7,244	5,378	9,140	8,960
Both Sexes.....	22,809	23,718	21,488	18,873	21,926	15,386	25,537	12,256	16,582	14,717	14,165	19,359	15,983	13,429	15,365	11,559	20,681	8,529

AGES.....	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
Females.....	5,595	4,787	4,892	6,189	4,253	3,775	4,421	3,549	5,947	2,649	3,594	2,955	3,029	3,984	2,756	2,187	2,413	1,977
Both Sexes.....	11,795	9,986	10,066	14,838	9,649	8,310	9,651	7,575	14,193	6,092	8,246	6,923	6,820	7,791	6,333	4,594	5,472	4,513

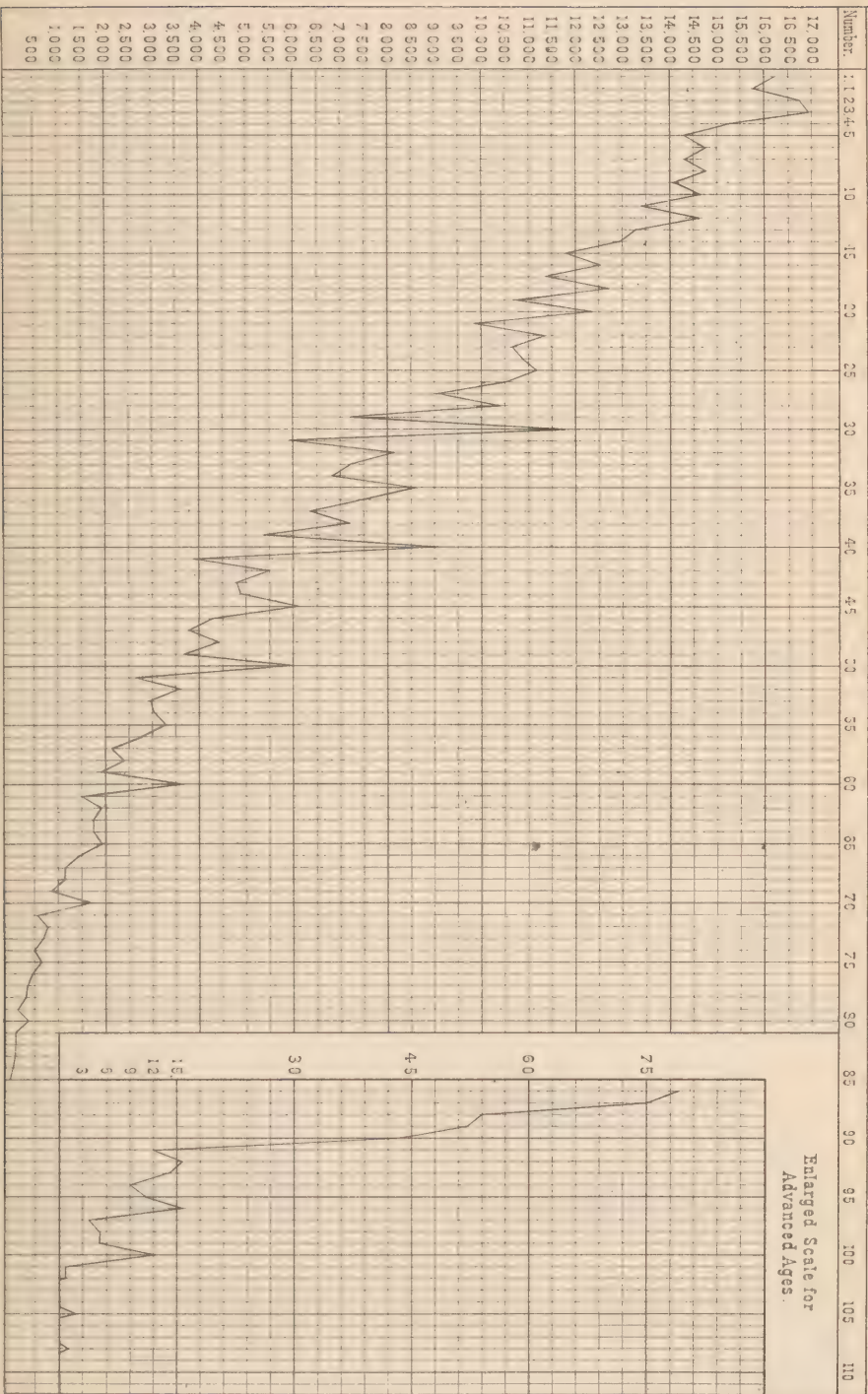
AGES.....	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77
Females.....	3,642	1,513	1,908	1,769	1,768	1,923	1,434	1,171	1,146	907	1,634	583	746	667	582	627	462	408
Both Sexes.....	8,060	3,431	4,291	4,917	3,844	4,413	3,167	2,621	2,409	2,225	3,711	1,382	1,665	1,805	1,303	1,366	1,049	886

AGES.....	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
Females.....	389	249	361	151	185	170	143	105	79	75	54	52	43	12	16	14	9	11
Both Sexes.....	892	541	751	311	368	351	388	204	169	158	119	95	91	27	30	25	24	17

AGES.....	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	Unk'n.	-----	-----
Females.....	16	4	5	5	12	1	1	-----	-----	2	-----	-----	1	-----	-----	151	-----	-----
Both Sexes.....	21	9	11	9	19	2	4	-----	1	4	-----	-----	1	-----	1	863	-----	-----

DIAGRAM N^o 4.

Total Female Population of Michigan in 1870, at every Age in Years.



To accompany "Statistics of Michigan 1870."

Designed by H.B. Parker, M. D.

Tables 5 and 6 exhibit the number of inhabitants of Michigan of each sex, and of both sexes, at every age, as returned by the Census enumerators. There is a very noticeable deficiency in the very first statement which represents the number of children aged under one month. This undoubtedly resulted from carelessness of the enumerators, and in a way which will be explained further on, in connection with the subject of births. There are other errors apparent only to those familiar with such statistics. For instance, the numbers returned at certain ages in months are such as, if believed correct, would show large numbers born in short months, and smaller numbers born in months longer by a day and which, other things equal, should show about one-thirtieth more births, when, taken in connection with other evidence, there is reason for believing that the numbers are in part displaced in a way to cause just this result. The deficiency in those aged under one month was in great part due to such displacement, which affected to some extent the statement of numbers at every age. Some of the evidence of this will also be given with the remarks on births.

Statistics of this kind are valuable somewhat in proportion as their accuracy renders it possible to employ them as bases from which by calculations to obtain answers to certain questions of importance to the people, as affecting their social or pecuniary well being. One of the most important of these questions is the one of the correct death-rate at every age, mainly for the reason that such knowledge would enable us to guard against special dangers to life at certain ages, and also for the reason that upon the death-rate is based a business which has much to do with the contentment and happiness of the people, and in which is involved millions of dollars of capital, calling out of this State annually, one or two millions of dollars for premiums for life insurance,—an amount of money, perhaps one-third as much as the total of all the State, county, township, city and village taxes for school and all other purposes in this State. The people pay this private tax, which in this case is called “premium,” without any real knowledge of the justice of its rates, and will probably continue to do so until they gradually obtain a knowledge of some of the benefits to be derived from accurate statistics, when they will doubtless conclude that it would be worth to them much more than it would cost if they could have continually in their employ some person or persons as well qualified to inform them of the justice and equality of the premiums they pay, as are the actuaries now employed by insurance companies to inform them of the probable profits which they may expect for their management of the life insurance business.

If accurate statistics cannot yet be obtained, it appears to be a matter of great importance to find out the reasons why, and wherein lie the sources of

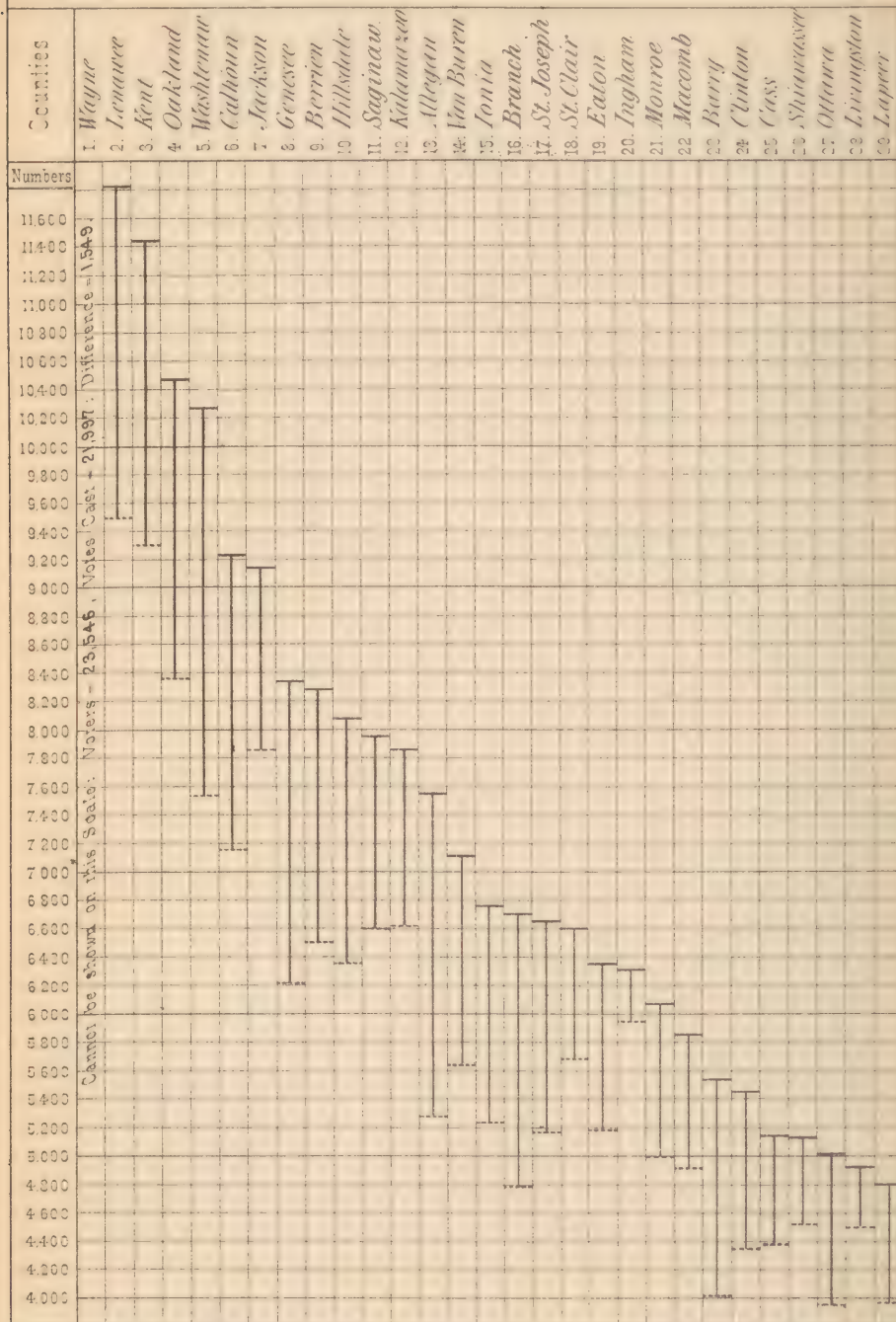
inaccuracy, in order that methods may be inaugurated which will tend towards greater accuracy in future, and also that such corrections and allowances may be made for present inaccuracies as will in some measure prevent wrong conclusions from statistics now collected.

Tables 5 and 6, and more especially Diagrams Nos. 3 and 4, reveal the fact that there are general laws which apply to some at least, of the inaccuracies in the statements of the age of the inhabitants by Census enumerators. These laws of method result from the tendency to state the age approximately in "round numbers," instead of accurately. The first general rule is that many more are stated to be aged even, than odd years. The exceptions to this rule are mainly according to another, which is that the importance and facility of expression of certain ages, such as 25, 35, 45, etc., will overcome the tendency to the first mentioned error and cause one in a contrary direction, showing a number greater than the true one at such ages. When the important age is an even year, such as 40, 50, 60, etc., the combined action of these first two rules results in a third class of errors which are so intensified as to become astonishingly manifest when the number of inhabitants is compiled by age in single years, as in Tables 5 and 6, and represented graphically as in Diagrams Nos. 3 and 4, from an examination of which it will be seen that if we were to believe the returns, we should conclude that there were more than twice as many of either sex aged 40, than there were aged 41; more aged 50 than 51; more 60 than 61, etc., etc. The statements of the numbers at these ages cannot possibly be correct.

The statements of the number of inhabitants as generally given in periods of five or ten years each, are quite materially influenced by the errors just noticed. If compiled in periods of five years, every alternate period will contain the important even year, and consequently be too large. Some persons, even among professed statisticians, continue to advocate compiling such statistics of inhabitants, deaths, etc., not by ages in single years as the writer has done, but only in periods of years, and this is the general custom. It will be readily seen that by such methods the errors described above would probably never be found or corrected, and the correct death-rate, or the true number of inhabitants by ages, would never be ascertained. The material in Table 5 was used in the construction of a "Life Table" for males, "Table VII," page 174, "Vital Statistics of Michigan, 1870," and the above described displacements of the numbers seriously marred the appearance of the table, although they did not so materially affect the statements of the "Expectation of Life" at the various ages as might at first seem probable. There are so many real inequalities in the number of inhabitants at the successive ages, that it becomes almost or quite impossible to so correct and equalize them as to represent the

DIAGRAM N^o 5.

Voters in Michigan June 1st 1870, by Counties in order of greatest Number, Greatest Number of Votes Cast for a State Officer November 5th 1872; and Difference between these Numbers.



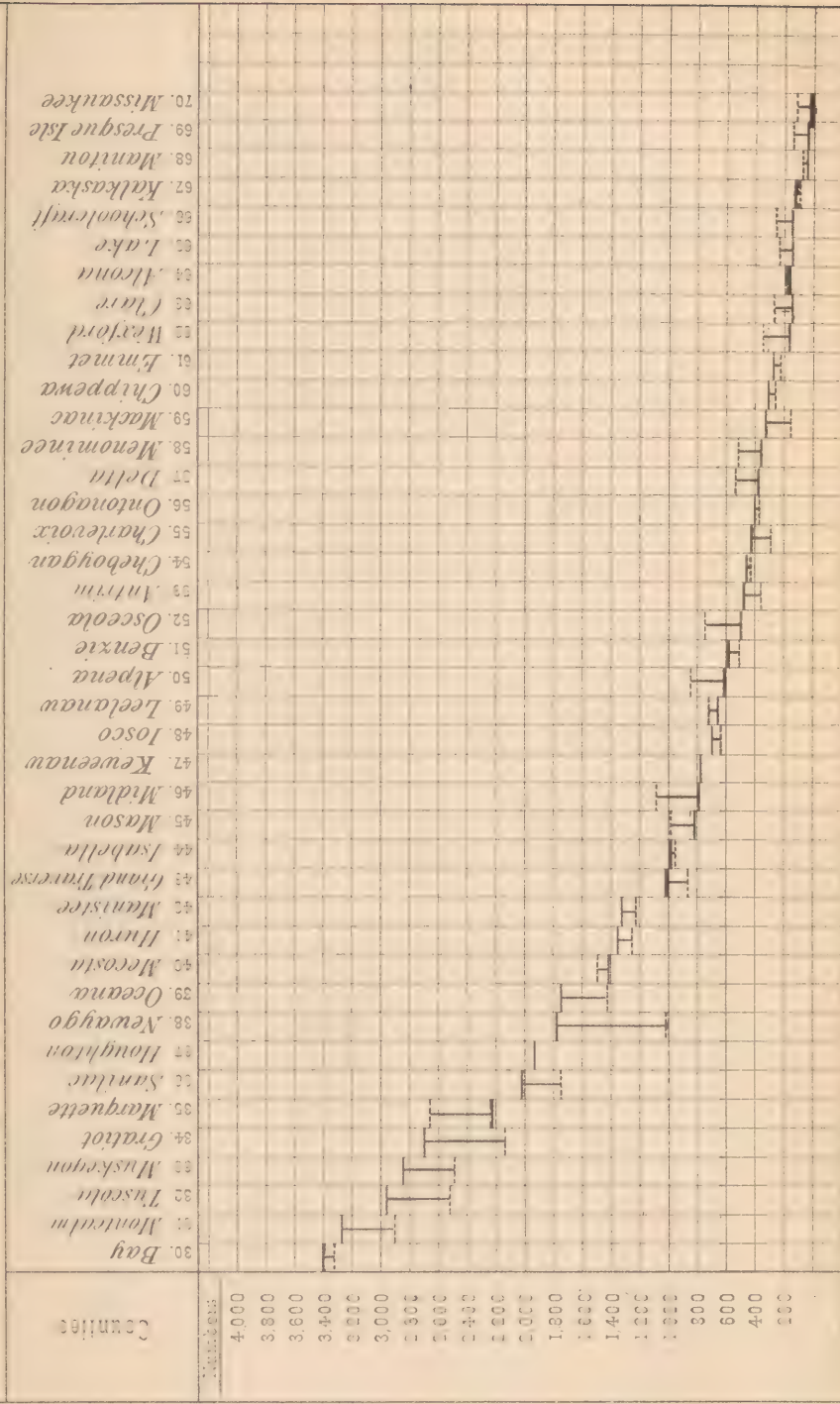
To accompany "Statistics of Michigan 1870"

Designed by H.B. Baker, M.D.

Explanations

— Voters June 1st 1870.
 --- Difference between Voters in 1870, and Votes Cast in 1872.
 ... Votes Cast November 5th 1872.

DIAGRAM N° 5. — Continued.



To accompany "Statistics of Michigan 1870."

Explanations

— Voters June 1st 1870.
 | Difference between Voters in 1870, and Votes Cast in 1872.
 ... Votes Cast November 5th 1872.

Designed by H.B. Baker, M.D.

of births obtained by the census in this population was 37,811. To obtain the number of births for a stationary population of 1,184,672 (the population at the close of the year), we make the proportion :

$$1,158,136 : 37,811 :: 1,184,672 : x,$$

in which x equals 38,677, or 866 births more than were returned. This number, 866, is an average of 2.285 per cent. of the number of births already obtained, and is to be added to them as a correction. But it is evident that the first month (June, 1869) should have twelve times as great a per cent. of births added as the last month (May, 1870), and that the per cent. for every month after the first should be a twelfth of the first less than the next preceding month. Hence we obtain the line "Per cent. of births to be added to equalize them to population at close of year," the average (2.285 per cent.) falling between November and December.

The total thus obtained to be added is 844, or 22 less than the number obtained by proportion. This difference arises from the fact that the number of births to be increased was not the same in all the months, being less than the average for the first months, which were multiplied by the greatest per cent.

In order to compare the relative number of births in the different months, it is necessary first to compute the number which would have occurred in each month if it had been of a fixed length uniform with the others.

The months, equalized to uniform length, contain 30.44 days each. To equalize the births to months of uniform length, we divide the number of births in each calendar month by the number of days in the month, multiply the quotient by the difference between this number of days and 30.44 days, and subtract the product from the number of births in the month when the month contains more, and add it when it contains less, than 30.44 days. This has been done in Table 4 for the births as obtained from the census; but it is very doubtful if the resulting statements by months are any nearer the truth, if indeed they are as near, for the reason that the births before this equalization are displaced out of the months in which they actually occurred, as explained in Table 3 and remarks following. The same method of equalization by months is employed in Table 6 concerning the births as per registration returns, in which case there seems to be no doubt but that it is applicable and essential.

TABLE 5.—*Exhibiting, by Months, the number of Births in Michigan during the Year ending June 1st, 1870, obtained from U. S. Census; the number thus obtained corrected,—for omissions in enumerating those whose Births and Deaths occurred within the year, and for the Months of June, 1869, and of April and May, 1870, because of wrong statement of Ages of Children living, and as thus corrected, equalized to a uniform Population, equaling that when the Census was taken at close of Year; also, the number of Births as returned by Registration Officers for the same Months; and these Births as corrected for time elapsing between their occurrence and enumeration, and, as thus corrected, equalized,—to a uniform Population equaling that at close of year, and also to Months of uniform length.*

	Total.	1869.							1870.				
		June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.
		Number of births obtained from census.											
Births, as obtained from census, corrected,—1st, For omissions in enumerating those whose births and deaths occurred within the year; 2d, for the months of June, 1869, and April and May, 1870, because of wrong statement of ages of children living; and births, thus corrected, equalized to a uniform population equaling that at close of year.													
	34,520	1,724	2,653	2,924	3,225	2,754	3,061	3,003	3,305	3,610	3,317	4,063	291
Births returned by registration officers.													
	35,655	2,616	2,973	3,189	3,464	2,901	3,834	3,128	3,422	3,709	3,380	3,033	3,001
Births returned by registration officers, corrected for time elapsing between occurrence and enumeration, and, as thus corrected, equalized,—1st, to uniform population equaling that at close of year; 2d, to uniform months of 30.44 days each.													
	27,140	2,055	2,471	2,731	2,681	2,508	2,361	2,512	1,994	1,737	2,009	2,076	2,275
	45,462	3,637	4,040	4,282	4,160	3,601	3,843	3,278	3,420	3,808	4,023	3,877	3,834

Table 5 exhibits in tabular form what is graphically represented in Diagram No. 6, and is printed here in order that the Table and Diagram may be readily compared.

DIAGRAM N^o 6. [Scale of 600 to an inch.*]

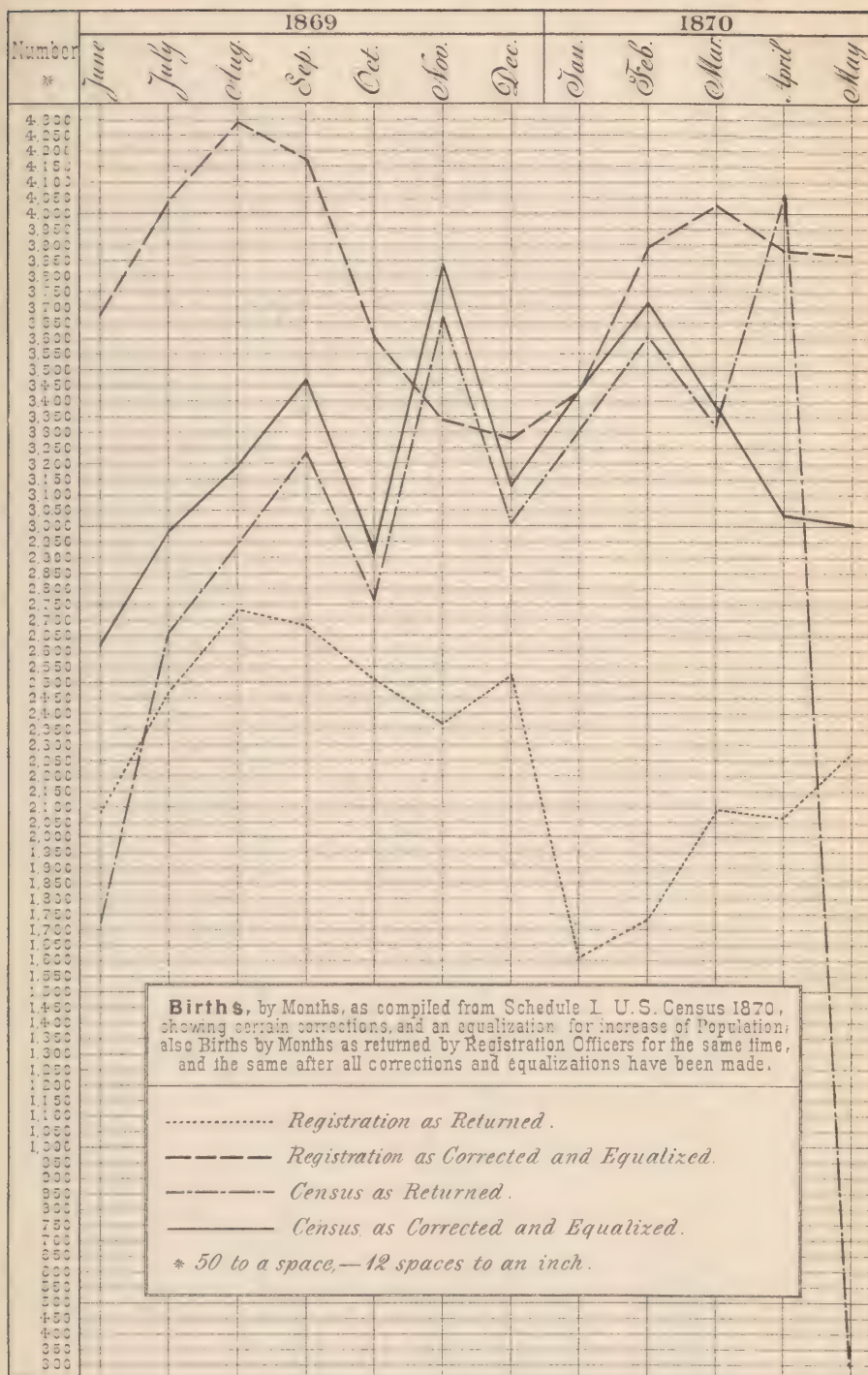


TABLE 6.—*Exhibiting, by Months, the Number of Births in Michigan during the Census Year ending June 1st, 1870, as returned by Registration Officers; the Number during the last Five Months of the Year, corrected by calculation for one year longer time before enumeration than elapsed before enumeration of Births for first seven Months,—giving the Calculated Number that would have been returned had they been enumerated in May, 1870, instead of May, 1871; the Number for the first Seven Months of Census Year as returned by Registration Officers, corrected by calculation, and for the last Five Months re-corrected, giving the calculated Number of Births as if enumerated in Months of Occurrence, as is made the case with May by the first correction; also, the Number of Births, by Months, equalized to a supposed constant Population equaling the Population at the close of the year; and the Number of Births thus estimated, equalized to Months of uniform length of 30.44 days.*

	1869.							1870.					Total.
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	
Births as returned by Registration Officers.....								1,604	1,737	2,009	2,076	2,275	-----
Per cent. of Births to be added for correction for one year additional time before enumeration.....								72.36	72.36	72.36	72.36	72.36	-----
Births to be added for above correction.....								1,161	1,257	1,519	1,502	1,646	7,085
Births, if enumerated in May, 1870, instead of May, 1871.....								2,765	2,994	3,618	3,578	3,921	-----
Births as returned by Registration Officers.....	2,055	2,471	2,731	2,681	2,508	2,361	2,512						27,140
Per cent. of Births to be added for correction for time before enumeration.....	66.33	69.30	54.27	48.24	42.21	36.18	30.15	24.12	18.09	12.06	6.03	.00	-----
Number of Births to be added for correction last mentioned.....	1,383	1,490	1,452	1,293	1,059	854	757	667	542	436	216	00	10,179
Births corrected as if enumerated in months of occurrence.....	3,468	3,961	4,213	3,974	3,567	3,215	3,269	3,432	3,536	4,054	3,794	3,921	44,404

TABLE 6.—CONTINUED.

	1869.							1870.					Total.
	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	
Per cent. of Births to be added to equalize them to population at close of year.....	4.21	3.56	3.51	3.16	2.81	2.46	2.11	1.76	1.41	1.06	.71	.35	.....
Births to be added to equalize them to population at close of year.....	146	133	143	126	100	80	69	60	50	43	27	14	1,016
Births, as corrected, equalized to population at close of year.....	3,614	4,114	4,361	4,100	3,667	3,295	3,233	3,492	3,586	4,007	3,891	3,935	45,420
Days and hundredths by which the months should be increased or diminished to equalize them to uniform length.....	+ 44	— .56	— .56	+ 44	— .56	+ 44	— .56	— .56	+ 244	— .56	+ 44	— .56	.....
Number by which the Births should be increased or diminished to equalize them to months of uniform length.....	+ 23	— 74	— 79	+ 60	— 66	+ 43	— 60	— 63	+ 312	— 74	+ 56	— 71	+ 42
Births, as corrected, equalized to months of uniform length.....	3,667	4,040	4,382	4,160	3,601	3,343	3,273	3,429	3,693	4,023	3,877	3,864	45,462

It is believed that the decreased number of births returned by the registration officers for the last five months of the census year, compared with the census, resulted from the omission of births because of one year longer time elapsing previous to their enumeration than passed before the enumeration of those for the first seven months of the census year. Omissions from the same cause occurred in the returns of births by the census only as regarded those whose births and deaths both occurred within the census year, which number was proportionally so small that for the purpose of correcting the registration returns the census returns for the months of December and January are regarded as sufficiently accurate. The ratio of births in December to the births in January by the registration returns should probably equal the ratio of births for the same months as shown by the census; we therefore make the following proportion:

Births by census.		By registration.	
Dec.	Jan.	Dec.	Jan.
3,003	3,305	2,512	x

in which x equals 2,765, the number that should have been returned for January. This is 1,161, or 72.36 per cent. of the births returned for that month, more than were returned.

It appears probable then that, under these circumstances, a delay of one year before enumerating births results in omissions to such an extent that 72.36 per cent. of the number enumerated must be added to them in order to make the number equal that which it would have been if enumerated one year sooner. In Table 6 this per cent. is accordingly added to the births for the last five months of the census year. This leaves the births for all the months as if enumerated in May, which is eleven months after the occurrence of the births for June,—the first month of the census year,—ten months after those for July, nine months after those for August, etc., etc. If, as we have assumed from the evidence, the omissions are in proportion to the time before enumeration, then the births for June,—the first month of the census year,—should be increased by eleven-twelfths of 72.36 per cent.; the births for July should be increased by ten-twelfths of 72.36 per cent., etc., as is done in Table 6, in order to ascertain the number of births which would have been shown if enumerated in the months in which they occurred. In order to make the births comparable by months, they are then equalized for growth of population and for different length of months, in the manner described and for the reasons given in the remarks following Table 4 and Exhibit C, page lxxx.

TABLE 7.—*Exhibiting, by Months, and the total Number for the Census year ending June 1st, 1870, the Births as returned by Registration Officers; the Number of Births for the last five Months of the Census year, increased by an estimated Correction for omissions resulting from one year additional time elapsing before enumeration,—giving the Number as it would have been if enumerated in May, 1870, instead of May, 1871; the Number of Births for the Census year increased by an estimated correction for omissions resulting from the time elapsing before Enumeration,—giving the Number as it would have been if enumerated in Months of occurrence; the Births so corrected, Equalized to a supposed uniform Population equaling that at close of year; and the Births thus Corrected and Equalized, Equalized to Months of uniform length.*

	TOTAL.	1869.						1870.					
		June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.
Births as returned by Registration officers.....	27,140	2,085	2,471	2,731	2,681	2,508	2,361	2,512	1,604	1,737	2,009	2,076	2,275
Births if enumerated in May, 1870, instead of May, 1871.....	-----	-----	-----	-----	-----	-----	-----	-----	2,765	2,994	3,618	3,578	3,921
Births corrected as if enumerated in months of occurrence.....	44,404	3,468	3,901	4,213	3,974	3,567	3,215	3,269	3,432	3,536	4,054	3,794	3,921
Births as corrected, equalized to population at close of year.....	45,420	3,614	4,114	4,361	4,100	3,667	3,205	3,338	3,492	3,586	4,097	3,821	3,935
Births as corrected and equalized, equalized to Months of uniform length.....	45,462	3,667	4,040	4,282	4,160	3,601	3,348	3,278	3,429	3,598	4,023	3,577	3,864

DIAGRAM N^o 7. [Scale of 500 to an inch.*]

Births in Michigan during Census Year, according to Registration Returns, also corrected for Certain errors, and equalized as necessary to make the Births comparable by Months.

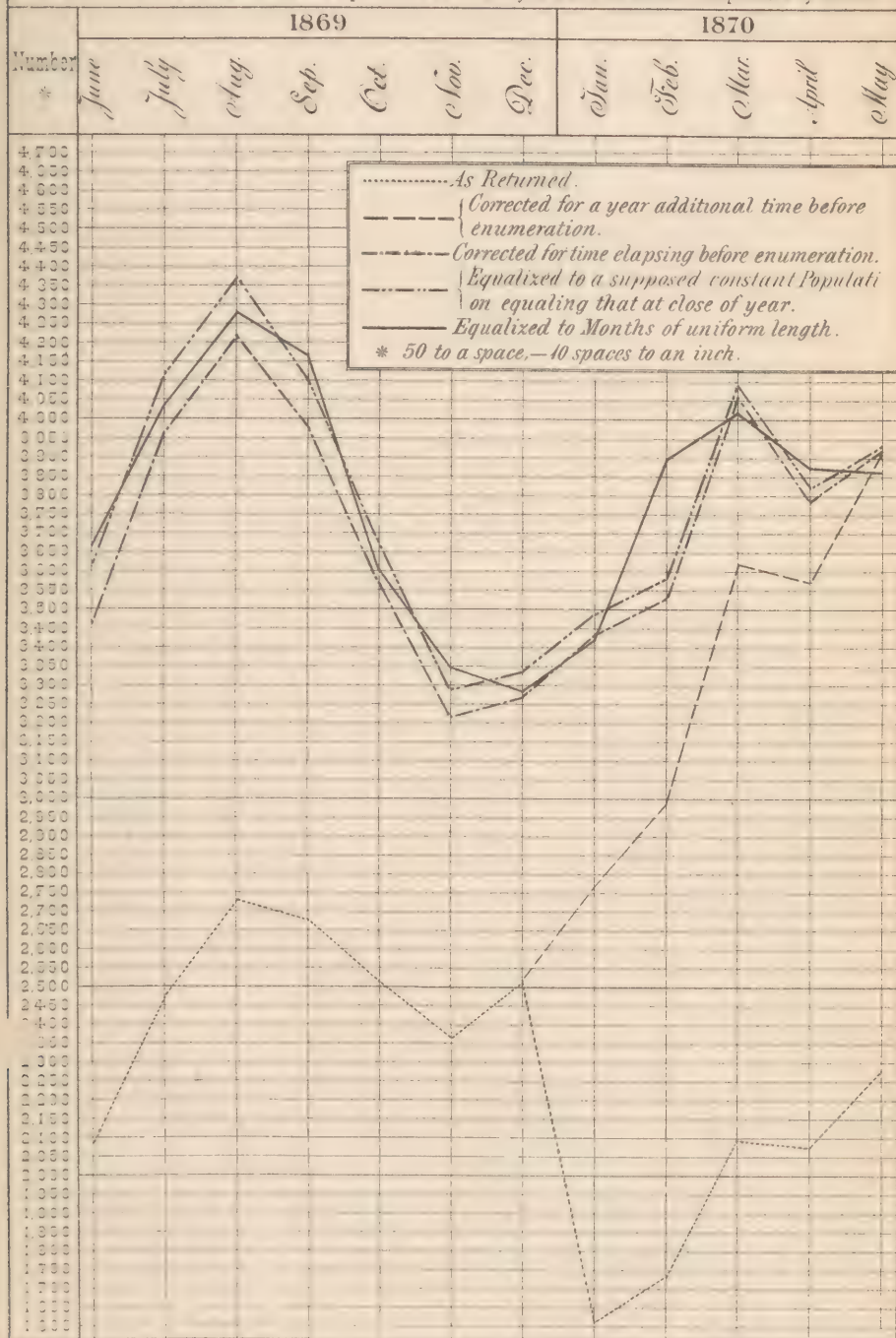


Table 7 and Diagram No. 7 exhibit the births in Michigan during the census year as returned by registration officers, and the results of the two corrections and two equalizations which are believed to be necessary in order to approximate to the true proportion in each month or the correct number during the year.

It appears that there were 27,140 births returned by the registration officers, whereas the evidence derived from the comparison of the statistics from the two sources leads to the belief that if the births had been enumerated in the months when they occurred there would have been 17,264 more, or 44,404 births during the census year. The number omitted is therefore 63.61 per cent. of the number returned. It seems probable that if the births during the past few years, as published in the registration reports of this State, should be increased by about this per cent., the resulting statement would be nearer the truth. These computations may also be applied to the births returned by registration in the future, until the census in 1880 furnishes a new test, or until such time as it becomes possible to have the registration law amended in a way to secure a more perfect record. This is secured in some other localities by requiring parents, physicians, and others to cause a record of every birth occurring in the family or under their charge to be filed with some proper officer.

The average annual increase of population from 1860 to 1870, as shown by Table 3, page xix., was 43,517. Subtracting the deaths as returned for the census year from the births as returned ($27,140 - 9,040 = 18,100$) it appears that for that year 18,100 of the increase should be attributed to natural growth of population by excess of births over deaths, and the remaining 25,417 to immigration. Or if we take the increase of population for the year 1870 from Exhibit C, as it is there estimated at 53,072, then ($53,072 - 18,100 = 34,972$) 34,972 should be attributed to immigration. But if instead of the births and deaths as returned we employ the number of births and deaths which we have reason to believe occurred ($44,404 - 16,802 = 27,602$) we find that for the census year the natural growth of population by excess of births over deaths was 27,602.

MARRIAGES.

Not one-half as many marriages were enumerated by the Assistant Marshals as were recorded by the State registration officers for the same time. Perhaps the most valuable result will be the strengthening of the evidence otherwise obtained that, by no system of enumeration of births, marriages, and deaths after the year during which they occurred has passed, can anything near the number be obtained as by a system requiring persons specified to furnish to

some officer a record of them within a short and limited time after their occurrence. Tables III. and IV., pages 231 to 235 inclusive, exhibit the marriages shown by the census and by the registration returns for the State and counties by months. The census returns were not even sufficiently accurate to supply any test of the truthfulness of the registration as regards the relative number in each month. For any further facts concerning marriages, the reader is therefore referred to the State Registration Reports.

DEATHS.

Table V., page 236, exhibits for the State and for each county the deaths of males and females in each month of the census year as returned by the assistant marshals; Table VI. exhibits for the State and by counties the total deaths by months as returned by the registration officers. Supposing the deaths to be enumerated by both classes of officers precisely in accordance with instructions then the difference between the results by the two methods should equal the deaths which occurred outside the State in families who moved into the State during the year. After making allowance for counties not represented in the registration returns, this difference, as shown by Table 9,—Summary of Deaths,—was 1,851, which is altogether too large to be accounted for in this way, and would seem to show that the returns of deaths by the census marshals were more complete than were those by the supervisors and assessors. This was the case in some of the counties, as will be seen by comparing the statements opposite the several counties in tables V. and VI. For instance, the supervisors in Allegan county returned only 195 deaths, while the assistant marshals returned 327. The supervisors of Branch county returned only 180 while the assistant marshals returned 267. The supervisors of Washtenaw county returned only 266 while the assistant marshals returned 414 deaths during the same time; but in the counties of Calhoun, Hillsdale, Marquette, Muskegon, Oceana, and Saginaw a greater number were returned by the supervisors. The difference shown on Table 9 would not have been so great except for the omissions in the registration returns for the last five months of the census year, believed to be due to the length of time which elapsed before the enumeration. If the returns for the last five months had borne the same relation to each other as they did for the first seven the difference would have been only about 96. After making the corrections shown on Tables 10 and 11 the difference was only 53. As will appear further on, the number of deaths returned by either class of officers is probably far short of the number which occurred. By combining the evidence from both sources it becomes possible, as is believed, to approximate the true number by months.

DEATHS OF FOREIGN-BORN INHABITANTS.

In connection with the relation shown in Table VII., page 244, between the per cent. of deaths of native and of foreign born inhabitants to population, certain facts should be considered which will modify very materially the conclusions which would otherwise be reached from the evidence of the table alone. Something more than one-third of all deaths in this State are of children under five years of age. Now, the children born in this country of foreign parents are included in the native population; their deaths are also included in the deaths of natives. On the other hand, very few children under five years of age immigrate into the State, the foreign born inhabitants are mainly of the middle ages, their death-rate, other things being equal, should be about that of persons in middle life. As a matter of fact, the average death-rate of those aged 15 to 65 was just about what is stated for the foreign born. That is, computing the death-rate from the deaths as returned, without any correction, just as is done in Table VII. The condition of the native and foreign born inhabitants being different as regards age, and the death-rate being different at different ages, the death-rate of the two cannot properly be compared in a direct manner. In order to make a proper comparison between them, it would be necessary to compute a Life Table for each class of inhabitants. We have seen above, however, that, so far as the adults are concerned, the death-rate is, probably, about the same for foreign-born as for native inhabitants. The death-rate of children born of native parents should be compared with that of children of foreign-born parents. This has not yet been worked out in this State.

TABLE 12.—Exhibiting, by Sex the Number of Children under One Year of Age who Died in Michigan during the Census Year ending June 1st, 1870; Distinguishing the months in which they Died, their age at Death in months, the months in which they were Born, and whether Born during the Census Year or in the Previous Year. ^a

Years & Months in which Births & Deaths Occurred.	AGES AT DEATH, IN MONTHS.												DEATHS BY MONTHS.							
	Number Born in each Month of Census Year.												Number Born in Each Month of Previous Year.				Of those Born in Cen- sus Year.			
	Years.	Total.	Sex.	Number of each Sex.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Total.	By Sex.	Total.	By Sex.	Total.	Total. Aged Un- der one Year.
June.....	1869.	213	Males.....	131	17	29	7	3	4	1	5	2	4	3	3	17	67	122	84	132
			Females....	82	13	20	8	3	3	4	2	3	1	7	2	13	55	68	68	
July.....		298	Males.....	127	17	28	16	5	8	7	11	3	4	7	9	55	77	147	132	225
			Females....	111	9	14	12	9	6	4	6	3	6	9	7	23	70	93	93	
August..		192	Males.....	98	13	39	16	13	15	14	18	9	11	3	13	68	110	210	178	244
			Females....	94	15	44	7	19	11	8	14	9	3	10	13	66	100	166	166	
Sept.....	1869.	181	Males.....	111	23	32	17	12	11	16	9	8	12	11	7	84	82	145	106	296
			Females....	70	14	26	10	17	12	11	4	5	8	7	8	67	63	130	130	
October..	1869-1870.	104	Males.....	58	16	38	7	8	5	6	3	3	8	4	4	74	31	63	105	194
			Females....	46	7	22	11	14	8	2	8	4	4	6	2	57	32	89	89	
November		141	Males.....	81	10	19	6	9	3	7	5	2	5	1	4	54	18	27	72	114
			Females....	60	9	11	2	4	5	2	2	2	2	1	2	33	9	42	42	
December		122	Males.....	73	15	32	3	8	13	3	8	4	2	4	..	82	12	27	94	161
			Females....	49	7	15	6	10	4	5	5	5	2	3	1	52	15	67	67	
January..	1870-1869.	141	Males.....	74	20	28	8	3	4	4	9	8	2	3	1	79	2	16	57	175
			Females....	67	13	26	7	7	6	7	9	6	2	4	1	80	8	88	88	
February.		143	Males.....	79	26	28	12	14	4	5	6	6	2	3	1	103	4	10	107	163
			Females....	64	15	23	3	6	5	2	11	3	2	..	3	80	6	86	86	
March....		114	Males.....	68	22	28	10	6	4	4	13	5	8	4	2	121	6	17	127	228
			Females....	46	17	28	9	6	12	2	5	3	4	4	6	90	11	101	101	
April.....		96	Males.....	54	26	32	8	6	6	4	6	10	5	10	8	121	1	2	122	207
			Females....	42	10	23	10	6	3	1	4	3	7	6	5	84	1	85	85	
May.....		43	Males.....	23	23	28	13	7	10	7	7	3	4	4	7	119	....	....	119	225
			Females....	20	20	26	6	11	6	4	10	4	6	3	4	106	....	....	106	

[illegible]

a The central part of this table, embracing the main Idea, has been invented by Mr. R. B. Callahan of this State Department; in adding the bottom and side parts of the table to facilitate methods of footing, he has had the assistance of the compiler, who regards Mr. Callahan's invention as a valuable contribution to the science of statistics.

Inasmuch as the death-rate is larger during the first year of life than at any other age, short of extreme old age, it seems important to study it a little more closely, more especially as a large proportion of the deaths among infants are believed to result from removable causes. Writers upon this subject have sometimes made the error of confounding a statement of the number of children who die before reaching the age of one year with a statement of the number who will die before the close of the year in which they were born,—two quite different statements, both of which are exhibited in Table 12—Summary of Deaths. Reflecting upon an apparent error of this kind in a statistical work, the writer requested two clerks at work upon the census to submit plans by which from a simple statement of the month of death and the age at death, as given in Schedule 2 and in the registration returns for those aged under one year, could be separately and rapidly compiled the number of deaths of those who were born in each month of the year of death, and of those who were born in each month of the previous year. Table 12 of this summary has resulted from this problem, the principle upon which it is based having been devised by Mr. Callahan. The table seems to answer the requirements perfectly. Although somewhat complicated in its construction it is believed that its statements may be easily understood, as may also, by means of the following explanations, the methods by which the statements have been reached :

The heavy angling line running diagonally through the table separates the deaths of children born within the census year from the deaths of those born in the year previous. The diagonal lines of figures separated from others by light and by dotted angling lines at the left of, and parallel to, the heavy diagonal line, exhibit, by months, those who were born within the census year; the first angling line of figures at the left of the heavy line being for the month of June, the second for July, etc. The footings of these lines of figures are written at the left of the central part of the table opposite the months in which the children were born.

The diagonal lines of figures separated by light and by dotted angling lines on the right of, and parallel to, the heavy line, exhibit, by months, those who were born during the year previous to the census year, being the year ending June 1st, 1869; the first line of figures representing those born in May, the second those born in April, etc. The footings of these figures are found on the right of the centre of the table opposite the months in which the children were born.

The perpendicular columns of figures exhibit the deaths at each age in months.

The horizontal lines of figures across the table exhibit the deaths by months.

The footings for columns representing deaths by ages, of those born in each year, and for the total deaths of those aged under one year, are written at the bottom of the table.

The footings for lines of figures representing deaths, by months, of those born in each year, and the total of deaths of those aged under one year, are shown at the right of the table.

That division of the table above the horizontal rule across the middle of the table and at the right of the dashed line, exhibits those who were born during the year 1868, previous to the census year, and died during the year 1869.

That division above the before-mentioned rule and between the heavy diagonal and the dashed line, exhibits those who were born during the year 1869, previous to the census year, and died during the same year, within the census year.

That portion of the table at the right of the heavy diagonal line and below the rule exhibits those who were born within the year 1869, previous to the census year, and died during the year 1870, within the census year.

That division of the table above the rule and at the left of the heavy diagonal line exhibits those who were born during the latter part of the year 1869 and died during the same year, within the census year.

That portion of the table below the rule and between the dashed line and the heavy diagonal line exhibits those who were born during the year 1869, within the census year, and died during the year 1870.

That part of the table below the rule and at the left of the dashed line shows those who were born during the year 1870 and died during the same year, within the census year.

For the convenience of statisticians or others who may wish to employ a similar table or to study this a little more closely, the manner of using this invention for statistical purposes is stated as follows: One man calls from the schedule the month of death and the sex of the decedent, followed immediately by the age at death, in months; another man checks (1) for each death, opposite the month called, in the column for the age called. The check-marks in each place are then footed, thus: $\frac{1111}{1}$. By footing the numbers thus obtained in different ways, we separate the deaths by months and also deaths by ages into those of children born in census year and of those born in previous year.

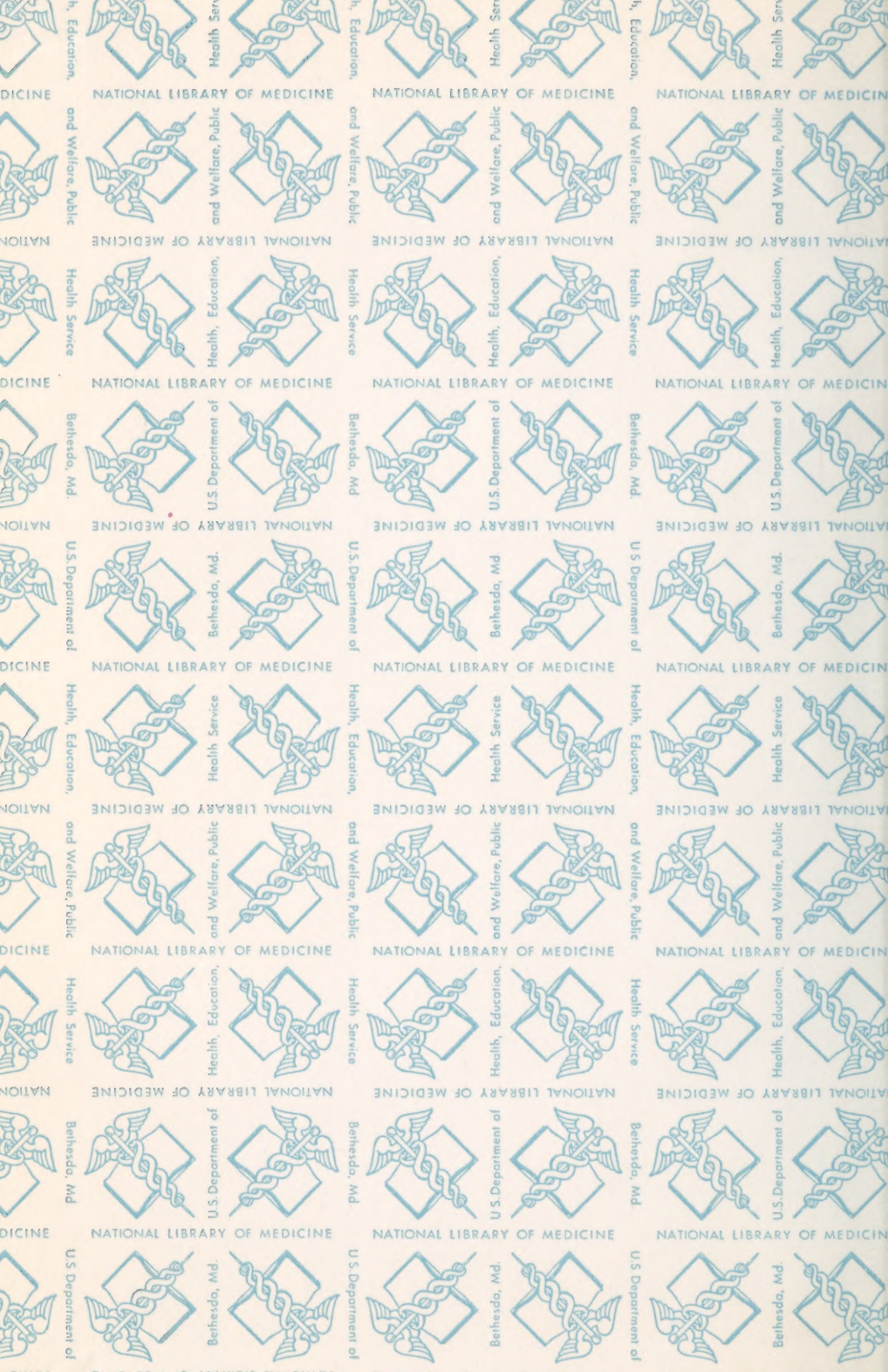
To obtain the deaths by months, all the numbers for the several months which are on the left of the heavy diagonal line are footed, placing the results on the same lines in columns on the right, headed "Census Year," giving one line for each sex. All the numbers on the right of the heavy diagonal line

are footed, placing the results in columns on the right, headed "Previous Year," giving one line for each sex. The footings of these columns will exhibit the total deaths by months of those aged under one year.

To obtain the totals for deaths by ages, foot all the figures on the left of the heavy diagonal line in each column and place the results at the bottom of the table on the lines designated as for "Census Year," giving one line for each sex. Foot all the figures in each column which are on the right of the heavy diagonal line, and place the results at the bottom of the table on the lines for "Previous Year," giving one line for each sex. The footings of these lines will exhibit the total number of deaths of those aged under one year, by age at death in months.

The diagonal lines of figures on the left of the heavy diagonal line are to be footed towards the top and to the left, placing the results in a column opposite the month in which they were born, as indicated by the course of the dotted lines. The footing of this column will show the number of those who were born during the census year and died during the same year.

The diagonal lines of figures on the right of the heavy diagonal line are to be footed towards the bottom and to the right, placing the result in a column on the right, opposite the month in which the births occurred, as indicated by the dotted lines. The footing of this column will show the total number of those who died during the census year who were born during the previous year.





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